FEBRUARY 1944

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TOOL & DIE JOURNAL

TOOLING AND PRODUCTION

PUTNAM Has 7[illegible] Items In Stock

One Is The Right Tool for *Your* Job

Pick up the Putnam catalog and select the end mill, counterbore or chucking reamer that meets the particular requirements of your job. We can ship any item listed in our catalog immediately and it will be in your hands within 48 hours.

Whether the job calls for a heavy cut, a smooth finish, or finishing an intricate contour you can count on Putnam Hi-Speed End Mills to deliver top performance. Why buy ordinary tools when you can get the best without delay?

ARMY E NAVY

PUTNAM TOOL COMPANY

2985 CHARLEVOIX AVE. • DETROIT 7, MICH.

SPEED UP THE JOB

Conserve LABOR AND MATERIAL

Use FCC Air Hardening Tool Steel Cast-to-Shape for blanking, forming, drawing, swaging and embossing dies; also for bushings, cams, shears, rolls and similar tooling.

These Cast-to-Shape steels deliver the job to you already half done. With only ⅛" to be machined off, even on the most intricate shapes, your dies can be put into production more quickly and at greater saving.

Cast-to-Shape tool steels are produced in a variety of analyses offering unusual resistance to wear and abrasion. They are manufactured in electric furnaces under precision laboratory control.

Back the Attack with War Bonds

Prompt delivery to your specifications

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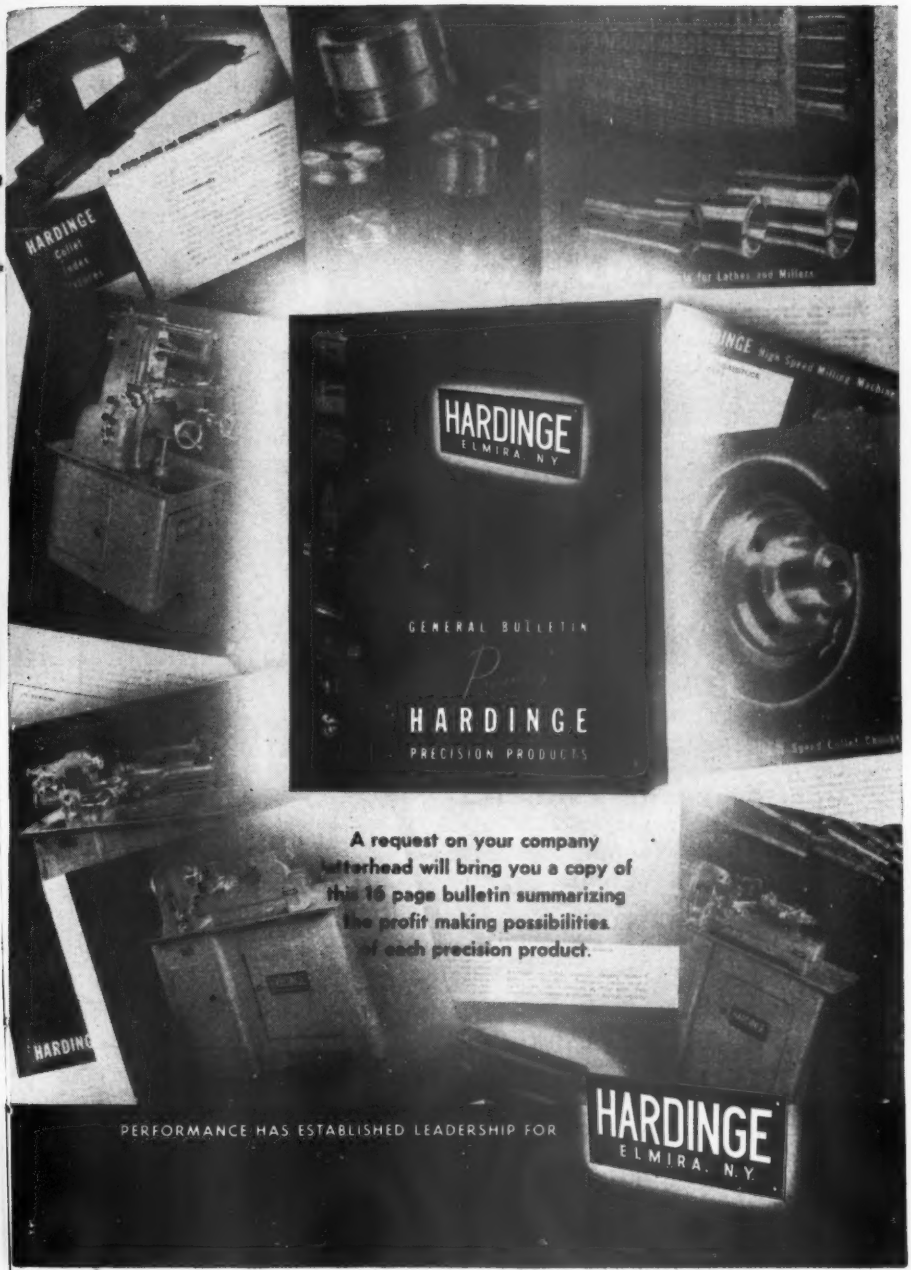
QUALITY FCC SERVICE

THE FORGING and CASTING CORPORATION

FERNDALE (DETROIT) MICHIGAN


HARDINGE
ELMIRA N.Y.
GENERAL BULLETIN
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PRECISION PRODUCTS
A request on your company letterhead will bring you a copy of this 16 page bulletin summarizing the profit making possibilities of each precision product.
PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR
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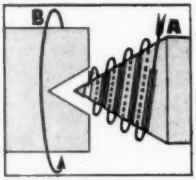
CMD

Helical Groove CENTERS AND HEAD STOCK CENTERS



Arrow A shows flow of lubricant around helical groove.

Now Available FOR IMMEDIATE DELIVERY!

For fast service on replacements, order centers from CMD. The famous CMD Helical Groove Center for tail stock has an exclusive helical groove which constantly conveys a supply of oil to the extreme point of the center. This unique design assures better lubrication, longer running time and greater machine output.

ORDER CMD CENTERS TODAY

When CMD Helical Groove Centers are used with CMD Center Point Oil they have an operating ratio of from 15 to 1 running time over the conventional type of lathe center.

Write for FREE Sample Kit

CHICAGO MANUFACTURING & DISTRIBUTING CO.
Dept. 2J, 1928 West 46th St., Chicago 9, Ill.

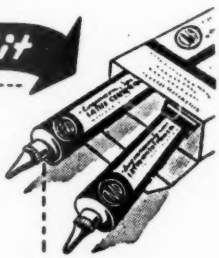
Send circular on CMD Helical Groove Centers.

Without obligation to us, send FREE sample kit containing a tube of CMD CENTER POINT OIL and a tube of CMD CENTER POINT LUBE (grease) with directions for making an amazing, simple test.

NAME .....

FIRM NAME .....

ADDRESS .....



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1947 W. 28TH STREET • CLEVELAND 13, OHIO

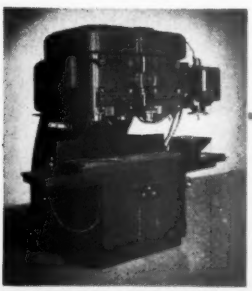
APCO
QUALITY PLATING

Here's Assistance

Behind every recognition for a job well done, the "E" awards and renewal stars for production, lies a tremendous amount of planning and thought. Without it, nothing would have been accomplished. Now, while production for war continues, a good part of the brain-power which planned the conversion can be applied to planning for the future. Every angle must be investigated, with full consideration to more efficient application of machinery.

Machine tools bearing the CINCINNATI trade mark, so prominent in tooling for victory, will again be applied to the production of automobiles, farm machinery, radio equipment and other consumer goods. Our engineers have long experience in offering the right machine, fixture, and cutters to meet specific requirements. Whether you are retooling for new war production or planning for the future, they will be glad to work with you on machining operations involving milling, grinding, broaching, lapping, die sinking and cutter sharpening.

CINCINNATI



THE CINCINNATI MILLING MACHINE CO.

TOOL ROOM AND MANUFACTURING MILLING MACHINES . . . SURFACE BROACHING MACHINES . . . CUTTER SHARPENING

FOR THAT NEVER-ENDING JOB

of Planning for the Future

A copy of our new General Catalog, No. M-995-2, is yours for the asking. Perhaps it will give you some ideas on machines for your future production lines.

Left: Here are two of the newer CINCINNATI Machines which are doing grand jobs of war production, and will take a prominent place in peace-time production. Literature on request. *Left:* CINCINNATI 4-Spindle 360 Degree Automatic Profiler (catalog M-1215). *Right:* CINCINNATI 6" Plain Hydraulic Grinding Machine, Model ER (catalog G-592).

CINCINNATI GRINDERS INCORPORATED CINCINNATI, OHIO, U.S.A.

MACHINES . . . CENTERTYPE GRINDING MACHINES . . . CENTERLESS GRINDING MACHINES . . . CENTERLESS LAPPING MACHINES

Die Sets don't sing IN G.I. QUARTETTES

American Servicemen—soldiers, sailors, and marines, will sing—nothing will stop them—no more than anything will stop them in their drive to victory.

Behind-the-line products that never get to the front, Danly Die Sets are stamping out and forming millions of parts for implements of war that will shorten the drive to victory for those tough, laughing, fighting men.

If you need die sets in your production, call Danly. Our facilities and services are still increasing to serve your immediate needs.

Call Danly:

CHICAGO	Lawndale 7440
MILWAUKEE	Broadway 1644
DETROIT	Cherry 6666
CLEVELAND	Express 0300
DAYTON	Fulton 6651
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DUCOMMUN METALS & SUPPLY CO.
Los Angeles Kimball 0181

DANLY MACHINE SPECIALTIES, INC.
2100 So. 52nd Avenue • Chicago 50, Cicero, Illinois

DANLY DIE SETS

Welded Steel Fabrication

War Production Gratified with Wide Applications for STANDARD JIGS...

SAVE TIME

A standard Siewek Drill Jig and adapter is easily and quickly set up—instantly ready to work on any particular part.

SAVE MATERIAL

Simple, material-saving accessories, as many as you need, fit the standard jig for a variety of jobs.

SAVE LABOR

In the toolroom, it is simpler and easier to make an adapter for the standard jig than a special jig for the job.

SAVE MONEY

One standard Siewek Drill Jig can take the place of dozens of special jigs.

At Left: Four S-2 Standard Spring Type Siewek Jigs on a rotary table.

Learn About Them Now for Efficiency in Finishing the War and Starting the Peace!

While there will always be the necessity for special jigs, standard jigs can be much more widely used in the shop than commonly believed—as is now being proven by amazing war production records. Futhermore, the reconversion to peacetime parts will not require a scrapping of these standard jigs—merely a replacement of the top plate and adapter.

It will pay dividends immediately on current production if you will find out now how standard Siewek Rapid Clamping Drill Jigs can be suited to your work. Contact a Siewek representative in your territory, or write us. *Send for Catalog No. 5J.*

Type N-Rack and Pinion Standard Siewek Jig

SIEWEK

RAPID CLAMPING STANDARD DRILL JIGS

SPRING or RACK and PINION TYPES • SQUARE or OVAL TOP PLATES • WIDE RANGE OF SIZES

Designers and Builders of SHEAR-CUT END MILLS

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OF DOMESTIC INDUSTRIES, INC.
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Representatives in Principal Cities

Affiliated with
SIEWEK ENGINEERING DIVISION
a nationally known organization staffed with experienced engineers—Consulting, Procuring, Designing, Fabricating and Efficiency Methods
CHICAGO DETROIT HARTFORD

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. . . makes faster delivery on these precision gauges

● Turner is making reasonably fast deliveries on their plug, ring, snap, flush pin and built up gauges. For up-to-the-minute delivery promises on these gauges write our sales department today. Remember to look for Turner's Stamp of Precision on the gauges you buy.

THE STAMP OF PRECISION

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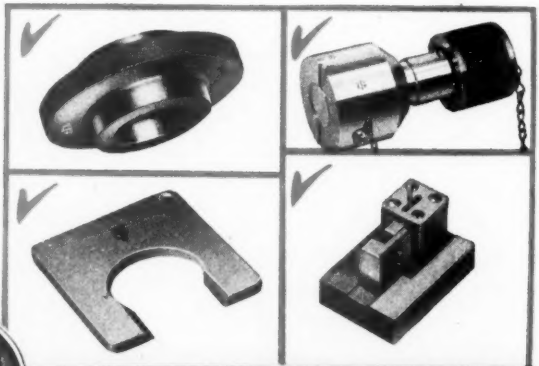


TURNER BROTHERS

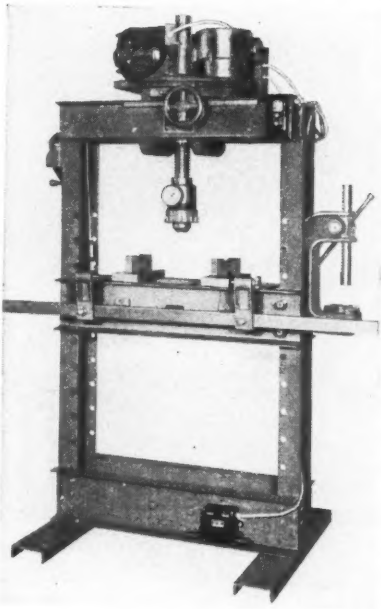
TURNER GAUGE GRINDING COMPANY

2625 HILTON ROAD • • • • FERNDALE, MICH.

PRESSUREMATIC

Automatic Pressure Control is Ideal for

TOOL ROOM OR PRODUCTION LINE



By setting the control gauge on the Lempco Electric Arbor Press, you can duplicate exact working pressures on your die try-outs. Equally efficient for press-fitting or assembling operations on production schedules. Solenoid controls stop ram at any pre-selected pressure—or even back ram off work if desired. Fast-action from 0 to 60 tons in 4 seconds! Moveable heads; adjustable bolster; foot-pedal switches; re-set switch and thermal relays protect motor from overloads. Pressurematics are made in both Electric and Hydraulic models.

40 and 60 Ton Models Priced From $215 to $1398

Lempco flies the "E" for Excellence in War Production.

Prompt Delivery! Priorities Can Be Had – Write Us.

SEE ONE WORK – MAIL THIS COUPON

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PRODUCTS · INC.

BEDFORD · OHIO · U·S·A

ESTABLISHED 1919

LEMPCO, Dept. TD, Bedford, Ohio

Gentlemen: Tell me plant nearest me where I may see a LEMPCO Press in operation.

NAME .....

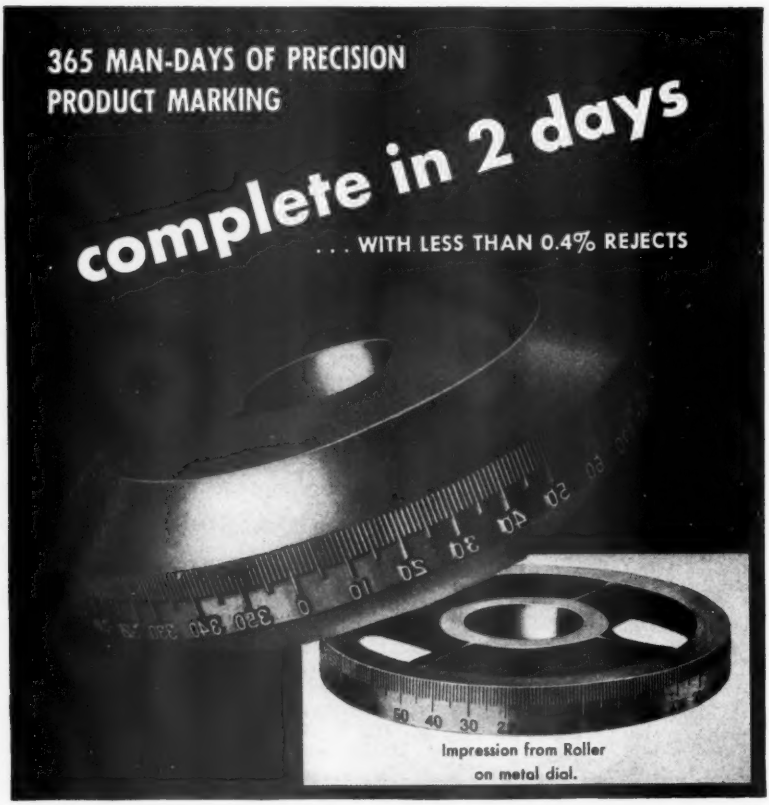
ADDRESS .....

CITY.....STATE.....

365 MAN-DAYS OF PRECISION
PRODUCT MARKING

complete in 2 days

. . . WITH LESS THAN 0.4% REJECTS



Impression from Roller
on metal dial.

This job called for calibrating 600 expensive dials. Extreme accuracy and minimum waste were essential. We estimated the job would take a full year for engraving!

Sossner master craftsmen produced a roller stamping die that turned the job out in less than 2 days! 598 out of the 600 dials passed the rigid inspection. Our customer saved both time and money. Let us duplicate this saving on all your marking requirements.

SOSSNER

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TAPS CUTTING TOOLS
STEEL STAMPS GAGES

Handbook on Precision
With this useful book on your desk, you'll always know where to look for Cutting Tools and Gages to help you maintain today's precision standards.
The gages and tools that bear the PM brand you can always trust—they are made by people who know your requirement.
Send today, on your letterhead, for your copy of the PM Handbook.
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The PIPE MACHINERY COMPANY Cleveland, O.
GAGES • HOBS • MILLING CUTTERS • SPECIAL TOOLS

A REPORT FROM AUSTRALIA

I have been informed by one of the users of a No. 10 Table which has now been delivered to the department through the lease-lend, that in their very first set-up, they informed the department that it saved them over £35 in the making of Jigs, and Clamps, and they found the accuracy to be absolutely perfect.

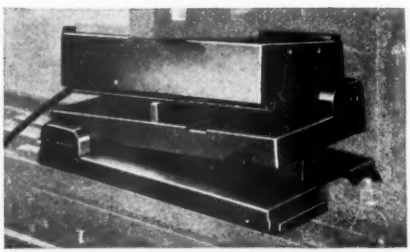
£35 SAVED IN ONE SET-UP !

on the EFFICIENCY of the MAGNA-SINE

All over the world the Magna Sine provides faster, more accurate angular grinding set-ups. The letter, from which one paragraph is reproduced above, comes to us from our representative in Australia and concerns a Magna Sine shipped under Lend Lease agreements.

The Magna Sine can provide comparable savings in your plant. Angles are measured by the sine bar and gage block method, the only scientifically accurate method of measuring angles, and the part is held securely at the turn of a switch. Every grinder that does an average volume of angular work should be equipped with a Magna Sine for top efficiency.

The Magna Sine is available in two sizes in both single and compound angle models. A non-magnetic sine plate for inspection purposes built on Magna Sine principles is also available. Deliveries on all items are good. Write for information today.



ROBBINS ENGINEERING COMPANY
318 MIDLAND AVENUE • DETROIT 3, MICHIGAN

For faster delivery

specify **DEARBORN** **GAGE BLOCKS**

THE DEARBORN GAGE COMPANY is able to make faster deliveries on their gage block sets, since the introduction of increased production facilities in their plant.

For those manufacturers who are in urgent need of Dearborn's Chromium Plated Gage Block Sets the Dearborn Gage Company guarantees reasonably prompt deliveries.

WRITE FOR THIS BOOK

This Booklet entitled, "How To Make Your Standards Last Longer," will give you some valuable information on the proper care of gage blocks. Please write on your company stationery giving your title or position, and this booklet will be sent to you.

Distributors in the principal cities of the United States and Canada.

DEARBORN GAGE CO. 22038 BEECH STREET DETROIT, MICHIGAN

Originators of Chromium Plated Gage Blocks

Do YOU KNOW about this HOLE CHECKER?

The American Hole Checker is an outstanding development with many important advantages for precision production:

It utilizes a simple and efficient principle of air pressure and volume. Operates on air pressure as low as 50 lbs.

It is quickly set by using high and low limit master ring gauges. Sizing plugs are specially designed and made of hardened steel, ground and precision lapped.

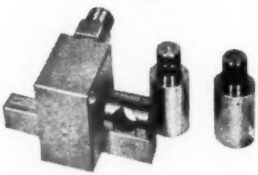
Simple and easy adjustment of high and low limits of tolerance on dial indicator. Can be calibrated to register .0001″ or less.

Checks holes without actually contacting inside surfaces. Eliminates possibility of scratching or damaging soft or burnished hole surfaces.

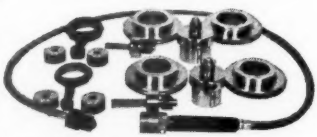
Modern design, with all working parts enclosed. Flexible hose adaptor for checking work on fixed machines or where work is too heavy to handle.

All sizing plugs and adaptors made to suit your requirements. Send your prints or sketches for quotations. Prompt deliveries assured.

Request Bulletin 43-TDJ for details. Also, data on American Amplifying Gages, Thread Checkers, Radius Dressers, Bench Centers, Lapping Plates and special Tools, Dies and Gages.



Hole Checker accessories for gaging outside diameter.



Flexible hose connection and various types of sizing plugs for use with Hole Checker.

THE AMERICAN GAUGE CO.
125 Bayard St. DAYTON 1, OHIO

CHICAGO MOUNTED WHEELS—The first small wheels ever mounted on stationary shanks, they have maintained their supremacy through the years. Over 300 sizes, styles and grains—one to suit every job. They're tough, long lived, dependable.

CHICAGO GRINDING WHEELS—To break production bottlenecks due to the crying need for small wheels, we gave up making all larger sizes for the duration — with full WPB approval — and now specialize on sizes 3" in diameter and under.

America's Unbeatables

Yes, all the wheels in our line are small, but powerful and *swift tools of war* doing their stuff day in and day out — making it possible to speed through everything that requires precision internal or external grinding, polishing and burring — bombsights, planes, tanks, guns, intricate instruments; etc.

• *Half a century of specialisation has established our reputation as the Small Wheel People of the Abrasive Industry.*

PROMPT DELIVERY—Come to America's Headquarters for Small Wheels, custom built to your order. No waiting for shipments now, and after the war a reliable source of supply. Our central location is another asset — cuts shipping time to most plants.

Send the Coupon for Illustrated Catalog

CHICAGO WHEEL & MFG. CO.

1101 W. Monroe St., Dept. TD, Chicago 7, Ill.

Test Wheel Free—So that you will know what Chicago Wheels can do, we'll gladly send one without charge. Tell us material you want to grind and size wheel you'd like.

TD-2

Send catalog. Interested in ☐ Mounted Wheels ☐ Grinding Wheels ☐ Send Test Wheel. Size____

Name_____

Address_____

One of our two engineering departments where expert production knowledge is translated into designs for production tooling equipment

From th finely e

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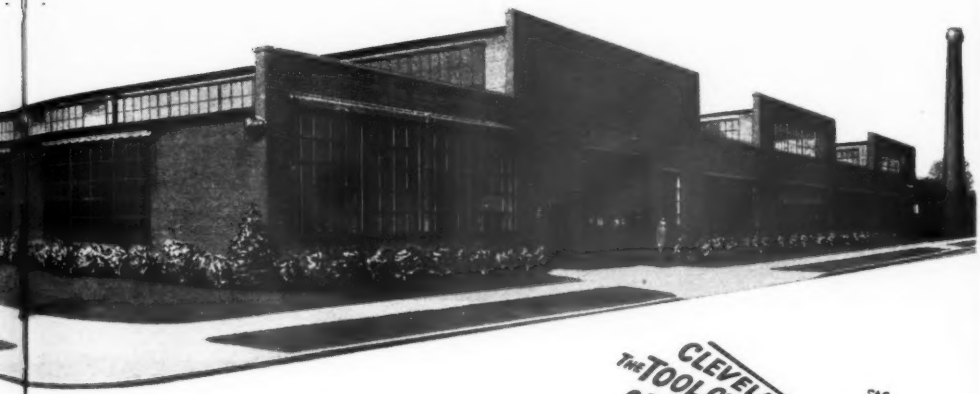
come industry's most efficient production to

Foundation stones of the McKinney organization are embedded in almost 25 years of successful, highly specialized activity; and today, this organization occupies a prominent position among leaders of the industry.

Wisdom and censorship still require that certain information be held in strict confidence. It can be said, however, that tool designs for producing many amazing devices and the actual tools that have built many of our high powered war weapons, have gone forth from the McKinney plant.

Through having done nothing else for so many years the McKinney organization is exceptionally competent to design and build tooling equipment embodying extreme

this specially designed equipped plant ★



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tools

accuracy, ease and facility of operation — and capacity for large volume production.

Consult us on current or contemplated work. Drop in and inspect our plant — write for a bulletin describing our facilities — have a McKinney engineer call for a discussion — or send blueprints on any pending job on which we can possibly be of assistance.

McKINNEY TOOL & MFG. CO.
CLEVELAND

DESIGNERS and BUILDERS of PRECISION TOOLING
Since 1920
1673 ARABELLA ROAD
Tools·Dies·Jigs·Fixtures·Special Machinery

MODEL KV 195

ZIP WORK GRIPPED!

ZIP WORK RELEASED!

That's how fast Knu-Vise clamps operate.

Clamp is adjusted for required pressure when job is begun —never changes until job is finished. Operator simply flips lever to clamp work in position and flips lever back to release it.

Clamp shown above is of double action type. Movement of clamping bar is slower than that of handle, thereby developing a high ratio of pressure applied to work being held in position.

KNU-VISE INCORPORATED

1330 Plum Street, Detroit 16, Michigan
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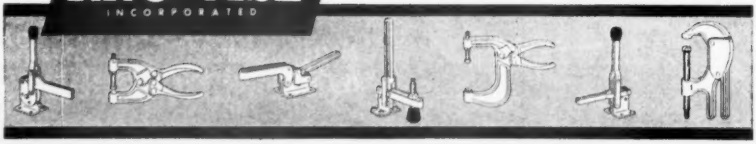


Complete Set of High-Speed Keyway Cutters . . $111.50 NET

PLUS HARDENED
The Extra Layer Doubles the Wear

Above Price Includes Hardwood Box

41 SIZES HI-SPEED

from No. 201 to letter "G"

A complete set of Hi-Speed Keyway Cutters, arranged in order in a serviceable, strongly constructed hardwood box. The right size always on hand when you need it. Saves costly delays! Saves time in selection! Saves the cutting edge in storage.

Double the Wear at No Extra Cost!

Experience of users has proved that, because of plus hardening, Fastcut, Hi-Speed Keyway Cutters actually last 2 to 3 times as long as ordinary cutters on the same identical jobs and under the same identical working conditions. Yet they cost no more than ordinary cutters.

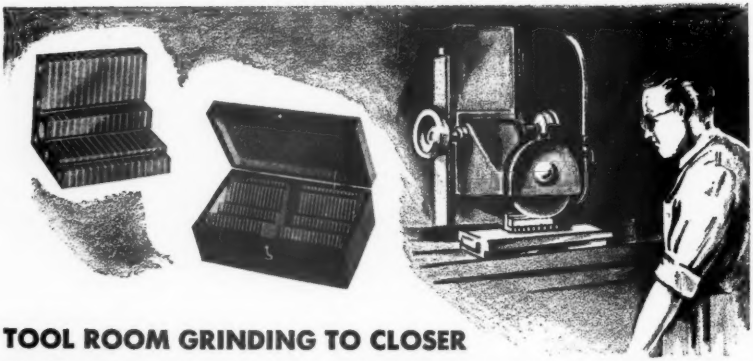
Act Now!

See your jobber or mill supply house—or write us for literature.

Write for LITERATURE

Fastcut TOOL COMPANY

2527 Hilton Road Ferndale 20, Mich.



TOOL ROOM GRINDING TO CLOSER PRECISION—*can be handled with greater speed and convenience with* SCHERR TOOL MAKERS ANGLE IRONS

Every good tool maker will welcome these new grinding room specialties because they enable him to hold thin work that cannot be clamped and grind it square with utmost accuracy and speed.

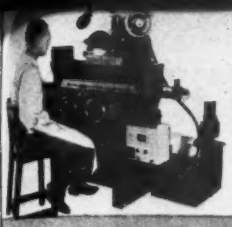
SCHERR TOOL MAKERS ANGLE IRONS, placed on your magnetic chuck, provide magnetic right angles having the same holding power as the chuck itself. A series of steps are available on which a wide variety of thin work may be placed and securely held during grinding operations by magnetic force without the use of complicated clamps and attachments. By using a sine bar or bevel protractor work requiring grinding at various angles may be laid out and handled.

Write for complete detailed information on SCHERR GRINDING ROOM SPECIALTIES which include Magne-Blox Angle Iron, Magne-Blox Laminated Magnetic Parallels and V-Blocks, "Little Wonder" Radius Dresser and other tool room and production tools.

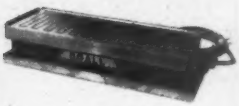
SPECIFICATIONS and PRICES

Single Tool Makers Angle Iron—in hardwood case. Overall dimensions: 3" x 3" x3⅛". **Price $23.50.** Matched Pairs Tool Makers Angle Iron—in hardwood case. **Price $45.**

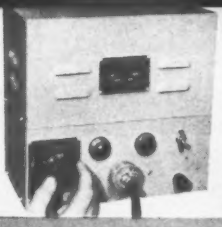
GEORGE SCHERR COMPANY, INC. 128-B LAFAYETTE ST., NEW YORK 13, N. Y.



DoALL GRINDER, Model G-1—The new hydraulic surface grinder gives up to .0001" tolerance. Designed for all precision toolroom work.



DoALL MAGNETIC CHUCK—Holds all work absolutely rigid. Mount on any grinder table. Wired for both 110 and 220 volt D. C.



DoALL SELECTRON—Provides DC current to chuck. De-magnetizes chuck in 15 seconds. Varies magnetic power to grind heavy, thin or fragile work.

DoALL *Presents*

COMPLETE EQUIPMENT *for* BETTER GRINDING

Establish a reputation for the finest precision grinding with these modern grinding necessities.

DoALL Products listed on this page, used in conjunction with any good surface grinder give a grinding service second to none for regular production or for tool room operations requiring grinding to very close tolerances.

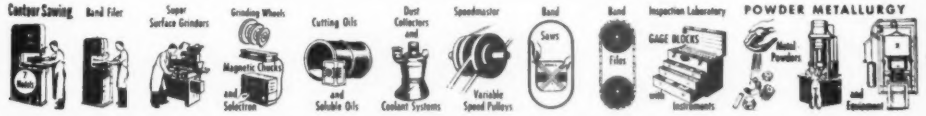
Send for the DoALL book illustrating all these Necessities.

DoALL DUST COLLECTOR (corner)—A compact unit that catches even the most minute dust particles. Noiseless operation. Easy to empty.

DoALL COOLANT SYSTEM—Dissipates heat and precipitates all grindings. Pumping capacity 1 to 30 gallons per minute, ample volume for all DoALL grinding operations.

DoALL 470 SOLUBLE OIL—Finest lubricant for all high precision grinding. Colloidal graphite homogenized to reduce friction, saves time and tools.

DoALL GRINDING WHEELS—Specially balanced to eliminate vibration. Necessary to really accurate surface work. Various grains; two sizes, 7 and 10" diameter.



DoALL

INDUSTRY'S NEW SET OF TOOLS

Write for Literature on above Products to

Continental Machines, Inc., 1303 S. Washington Ave. Minneapolis 4, Minn.

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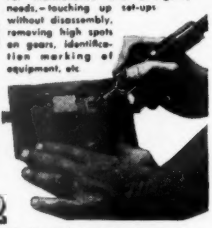
Choice of AMERICA'S LEADING
ARSENALS OF DEMOCRACY
for

For maintenance and emergency needs,—touching up set-ups without disassembly, removing high spots on gears, identification marking of equipment, etc.



1

2

In die and tool departments, for grinding, finishing and touching up dies, molds, jigs, etc.

3

For de-burring, grinding, finishing, polishing and other light production jobs—particularly valuable on irregularly-shaped parts

No matter what kind of equipment you have—
no matter what type of work you do—

Foredoms can boost your production!

Ford, General Motors, Chrysler, Nash Kelvinator, Jack & Heintz, Sperry Gyroscope, Bendix, Westinghouse and many other leading war plants are equipped with Foredom Flexible Shaft Machines! Foredoms eliminate many types of old-fashioned, time-consuming handwork and thus speed up production. Foredoms are just as ready to "pinch-hit" in emergency breakdowns. Models from $17.50 to $48.75. Our catalog No. 433 just off the press, shows the many uses of Foredom Flexible Shaft Machines in many different kinds of industries. Find out how a Foredom can help solve today's production and maintenance problems in your plant. Send for this catalog today.

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Another Foredom Time-Saver

GRINDING KIT

Model 111

One of Foredom's complete line of versatile utility grinding kits preferred by so many plants for emergency and maintenance needs. You too will find it pays to spot them liberally about your plant. Pencil-size handpiece facilitates getting into tight corners for touching-up production set-ups. Complete with accessories $23.50.

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Order from your regular Mill Supply House or direct.

Foredom
FLEXIBLE SHAFT MACHINES
SOLVE MANY PRODUCTION AND MAINTENANCE PROBLEMS
FOREDOM ELECTRIC CO 27 PARK PLACE, NEW YORK CITY

Foredom Electric Company,
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Please send us your new catalog No. 433 showing the different uses of Foredom Flexible Shaft Machines.
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Sav-way Announces—

A NEW SET OF MASTER SETTING AND CHECKING ROLLS

A Really Accurate Method for Checking Micrometers and Other Precision Inspection Devices

Your precision tools and inspection devices are only as accurate as the methods and gages by which they are set and checked. When anvils are worn unevenly, flat gage blocks are not adequate. This Sav-Way Set of Master Setting and Checking Rolls provides for the first time a really accurate means of checking micrometers, snap-gages, amplifiers, and dial indicators under all conditions of wear. The set consists of 20 rolls ranging from .100" to 2.000" in diameter. Rolls are hardened, ground, and lapped to X gage tolerance. The set is housed in a modern transparent plastic case.

Send the Coupon for Illustrated Circular and Price

Sav-way **INDUSTRIES**
Products Division
4875 EAST 8-MILE ROAD • DETROIT

SAV-WAY INDUSTRIES
Box 117, Harper Station, Detroit 13, Michigan
Please send complete description and price of Sav-Way Master Setting and Checking Rolls.

Name _____
Firm _____
Address _____
City _____

Fonda gage blocks are made in AMERICAN STANDARD and METRIC sets to an accuracy of two, four and eight millionths of an inch.

These superior gage blocks are hardened, ground and finished in accordance with the strictest specifications. All blocks are guaranteed flat and parallel.

THE ULTRA FINISH developed by Fonda engineers make these blocks unlike any other. This finish provides high resistance to wear, and better wringing qualities as the surface of the block is free from peaks that quickly wear off in use leaving the block undersize.

THE STABILITY of the Fonda gage block is attained by use of a scientific process developed by the Fonda Gage Co. On a recent test conducted by the National Bureau of Standards, Washington, D. C., the Fonda gage blocks passed all requirements for stability.

Write Dept. C for a detailed folder

FONDA GAGE COMPANY

175 FIFTH AVENUE — FACTORY: STAMFORD, CONN. — NEW YORK, N. Y.

Agents in all principal cities throughout the World.

1903 — How crude, flimsy and slow this hand-made plane of 41 years ago compared to today's aircraft.
NEW SPEED FROM NEW ACCURACY!
1944 — New accuracy of precision gages and production tools make possible new production speeds . . . stronger, faster planes.

WEAR-TESTED METALS STEP UP TODAY'S PRODUCTION

Old in experience and resourcefulness, Woodworth has charted new ways to speed war production and to cut inspection costs.

American war industries quickly found they could obtain new speed from the consistent accuracy of Woodworth precision gages, ground thread taps, form tools and other perishable production tools.

Wear-tested metals give Woodworth accuracy its extra-long life. Every piece of metal used in Woodworth gages is tested for wear by the severest modern methods.

Consult our Engineering and Development Departments on problems involving gaging and production tools.

ACCURACY YOU CAN TRUST

WOODWORTH

N. A. Woodworth Co., Sales Division, 1300 E. Nine Mile Road, Detroit 20, Michigan

PRECISION GAGES • GROUND THREAD TAPS • FORM TOOLS • PRECISION MACHINED PARTS • HEAT TREATING • PLATING

MASTER WORKMANSHIP
Our experience as Army and Navy materiel tool and gage makers will be incalculably valuable to manufacturers when their conversion to peacetime production requires prompt delivery of dependably accurate Gages, Jigs, Fixtures and other Special Precision Tools. We also specialize in Thread Grinding. Our inspection meets the most exacting specifications.

TOOLS & GAGES, INC

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ARMY E NAVY

Save Hours

On Difficult Wheel and Tool Forming Jobs

. . . with

The New

MEYERS

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WHEEL and TOOL FORMER

ELIMINATE WHEEL FORMING and many vital man hours and loss of critical tool steel stock, by mounting and forming tools directly against a standard wheel without first forming the wheel.

Demonstration models for trial use and completed tools for examination from local representatives. Write, wire or call today for immediate interview.

W. F. MEYERS COMPANY

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Tannewitz VARIABLE SPEED BAND SAWS Are Metal-Cutting EXPEDITERS!

Removing gates and risers from steel, cast iron, manganese, bronze, hard and soft brass, aluminum and magnesium castings, as well as many other metal cutting jobs handled with great dispatch and surprising savings on TANNEWITZ VARIABLE SPEED BAND SAWS. And since they are available in any 3:1 speed ratio from 100:300 to 1000:3000 blade feet per minute, with instant adjustment to intermediate speeds, one machine serves ideally for cutting a variety of materials. Made with 30", 36" and 42" wheels.

Other models (single speed) for such purposes as sawing large blocks of aluminum and magnesium, cutting large steel templates, etc., are available in capacities and speeds to ideally accommodate work of practically any size or character. For complete facts write for bulletin on Variable Speed Band Saws. Also on request, bulletins on: Sheet Metal Cutting Band Saws; DI-SAWS, combination band saws for sawing, filing and polishing.

THE TANNEWITZ WORKS, GRAND RAPIDS, MICHIGAN

AMAZING DISCOVERY REVEALED

NEW MIRACLE CUTTING-COMPOUND

Leading War Plant Reports Sensational Results In This Accurate, Reliable Test

Drilling armor plate, a quota of 300 pieces per eight hour shift per drill press was established but had never been met.

Two regular operators on identical drill presses, doing the same work, one using INSTA as the coolant, the other using standard cutting oils were selected.

BELOW ARE THE RESULTS OF ONE DAY'S RUN:

	Operator No. 1 Regular Cutting Fluid	Operator No. 2 INSTA
Rate (hr.)	$ 1.00	$ 1.00
8 hr. Production units	75	300
Unit Costs—Labor	$ .106	$ .026
Operation Stoppages (To replace or sharpen drills)	18	0
Labor Cost 300 Units	$31.80	$ 8.00
INSTA		$ .75
Total Cost (300 Units)	$31.80	$ 8.75
Saving with INSTA (300 Units)		$23.05

- Run Carbon Drills at Recommended Speeds for High Speed Drills
- Run High Speed Drills 50% Faster
- Reduces Rejects
- Non-Injurious to Skin
- Practically Eliminates Smoke
- Precision Holes and Threads Quick
- Saves Drills, Taps and Dies

ACTUAL STATEMENTS from Outstanding Defense Plants Praise Its Unbelievable Results

"Nothing like it for taps and dies"
"Truly a miracle"
"Hard to believe actual results"
"Astounding"
"Can't be done — but INSTA did it"
"Greatest time-saver ever used"
"Greatly increased our production"
"Practically eliminated drill breakage"
"The drill doesn't seize"
"Will save us thousands this year"
"We advise INSTA for all metal drilling"
"Your claims understated"
"Truly the vehicle for shop profits"
"Our men won't be without INSTA"
"Worth many times its cost"
"Surely speeds up our war production"
"Timely — We have long wanted something like INSTA"
"Our men proud of their increased production with INSTA"
"Precision holes *fast*"
"Rejects cut to bone"

Miraculous NEW

INSTA COOLANT CUTTING COMPOUND

TRADE MARK REG.

"Ingredient x", a newly discovered wonder-worker, compounded in the base actually *eliminates static electricity*— the cause of friction and heat in metal to metal contacts. Particles of metal *do not* build up on drill, causing oversize or oblong holes and excessive tool breakage. You get precision holes quickly and clean, sharp threads. See your local dealer or distributor, or write or wire immediately for full facts.

TERRITORIES OPEN for a few go-getting, properly financed distributors. Write!

The FINEGAN-CAMPBELL COMPANY Dept. 201

International Sales

1016 Baltimore Ave. Kansas City 6, Mo.

Write for your copy

. . . of the new L & I GROUND FLUTE REAMER price list

The new prices on L & I Ground Flute Reamers now make the superior results and longer life of these ground flute reamers available at the price of ordinary milled flute reamers.

SUPERIOR PERFORMANCE

L & I Ground Flute Reamers have the keenest cutting edge possible, because it is ground on both faces after being heat-hardened in bar form. They are ground from the solid, making possible greater uniformity and accuracy. Carefully lapped before grinding, they have many times the useful life of non-lapped reamers, and therefore cost less to use.

AT LOWER COST

— LAVALLEE & IDE L&I CHICOPEE, MASS. —

SEVERANCE MIDGET MILLING CUTTER GIVES PERFECT FINISH INSIDE INTRICATE CASTING

With a Severance Special Ball cutter, the hard-to-get-at flash edge on this aluminum elbow is quickly and perfectly removed.

Severance Midget Milling Cutters are efficiently finishing castings, parts and patterns made of metals, alloys, plastics and wood. With portable power tool, with stationary set-up or by hand, Severance Cutters do the finishing job cleaner, faster and easier.

If you wish to speed up your finishing of manufactured parts send us samples. Our engineers will help you determine the kind of cutter best fitted to your needs.

Severance complete line of "Carbide" Midget Milling Cutters are now available.

Severance

SEVERANCE TOOL INDUSTRIES INC., Saginaw, Michigan. Plants in Long Island City, N. Y.; Detroit, Mich.; Fort Wayne, Ind.; Chicago, Ill., and Los Angeles, Cal.

ANNOUNCING THE *NEW* AND *IMPROVED*

Welch QUICK DEMAGNETIZER

220
VOLTAGE
Now each Welch Demagnetizer is equipped with a momentary contact foot switch. There are no buttons to push . . . just step on the switch and "presto" it demagnetizes. Power is automatically cut off the instant foot pressure is released. This economical feature conserves power, saves time and prolongs the life of the Demagnetizer.
Complete price with 11 feet of insulated cord, $120.00.
(Formerly Demagnetizer Alone sold for $120.00)

IT'S BUILT TO LAST

The Welch Demagnetizer is an outstanding unit needed wherever magnetic chucks are used. Any ordinary sized pieces can be demagnetized by a single pass through its powerful field. Can be easily connected by your own electrician. If your power is other than 220 volt, 60 cycle A.C., please let us know.

10 days free trial if desired . . . *Immediate delivery*.

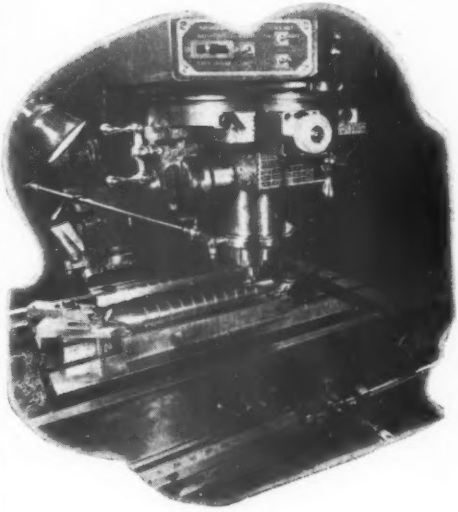
OPERATES ON 220 VOLT A.C. 60 CYCLE

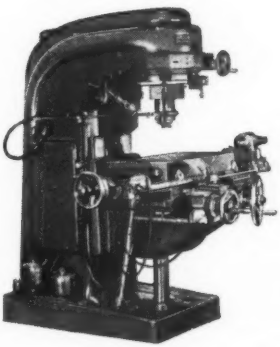
Welch INDUSTRIES MACHINE TOOL DIVISION, INC.
19400 W. 8 MILE RD. DETROIT 19, MICHIGAN

ROTARY HEAD MILLER . . . PLUS CHERRYING ATTACHMENT . . . SIMPLIFIES THIS "*TRICKY*" MILLING OPERATION

The Milwaukee Rotary Head Miller equipped with a cherrying attachment made "short work" of the *"tricky"* milling required on this injection mold. It took just two hours to complete the job — far less time than by any other method known.

The cherrying attachment is an auxiliary rotary head, mounted at 90° to the head of the miller. It is used to mill circles and angles in a vertical plane. When used with rotary head motion, spherical and conical cavities can be accurately and rapidly milled — in almost all cases difficult operations become a comparatively simple task.





KEARNEY & TRECKER'S ROTARY HEAD MILLER

The Most Versatile Machine Ever Designed for Mold and Die Work

DIRECT . . . mills mold cavities in a single set-up without the aid of templets or models.

ACCURATE . . . chances for error are eliminated because there is no change in set-up. Exact control of all combinations of cutting movements — possible only with this machine — transmits mathematical precision to the work.

FAST . . . initial job preparation and set-up time is reduced to the minimum. Accurate performance of the machine saves operator's time and rapid production of intricate molds and dies is the result.

Write for Bulletin No. 1002C for complete information on the Milwaukee Rotary-Head Miller and the accurate and rapid production of all types of molds and dies.

Rotary Head Milling Machine
Autometric Jig Borers
Center Scope

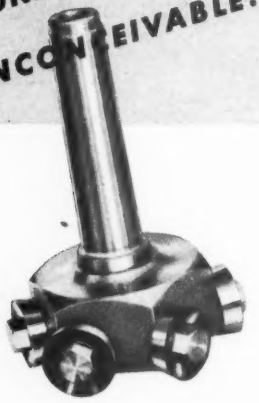
Kearney & Trecker *Products* CORPORATION
Milwaukee, Wisconsin
Subsidiary of Kearney & Trecker Corporation

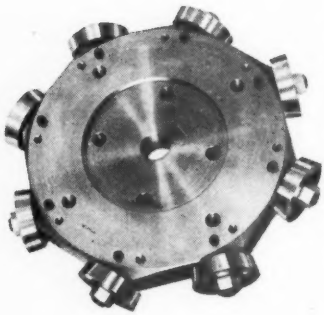
Milwaukee Face Mill Grinder
Milwaukee Midgetmill
Milwaukee Speedmill

AMAZING!

UNBELIEVEABLE!

INCONCEIVABLE!





SHEARCUT

LIFETIME

MILLING CUTTERS

INCREASE PRODUCTION AT LESS COST

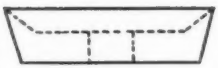
These completely new type circular milling cutters have a life of 100 to 500 times longer than the life of the usual straight tooth milling cutters. The circular cutter bits mounted on the cutting edge head have from 10 to 30 sharp cutting edges available before regrinding is necessary. Ordinarily these cutting edges may be operated from five to thirty weeks, and each of the cutter bits may be re-sharpened from 50 to 500 times before the cutter bit is entirely worn out—insuring true LIFETIME service.

Shearcutters remove curled chips in a true shearing action. When a cutting edge is dulled, simple rotation of the cutter a fraction of an inch presents a new sharp edge. The adjustment requires less than a minute, does not disturb set-up. Regrinding is a simple, quick job that does not require experienced help.

Shearcut Milling Cutters usually leave no tool marks. They may be rotated in either direction, generate less cutting heat and so save power and time, do not weld, take very heavy cuts with extreme ease . . . *quickly pay their cost.*

Stock Sizes: 3" now available; 18" in 60 to 90 days. Over 18" to 60" on special order. Prices: Tool complete with H-S Steel cutter bits, $20 per diameter inch. *Immediate delivery* on 3" Cutting Head, price $60.00; with #40 National Standard Shank, $70.00; with #9 Brown & Sharp Taper, $65.00.

Shearcut "Lifetime" Milling Cutters are designed and Manufactured by the Fearless Tool Co.

CROSS-SECTION OF  CIRCULAR SHEARCUTTER

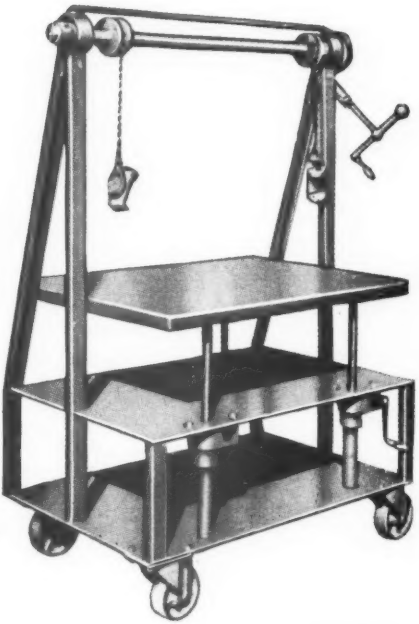
SHEARCUT TOOL CO.

DEPT. 000

19600 Sherman Way

Reseda, California

ONE MAN HANDLES DIES UP TO 3000 LBS!

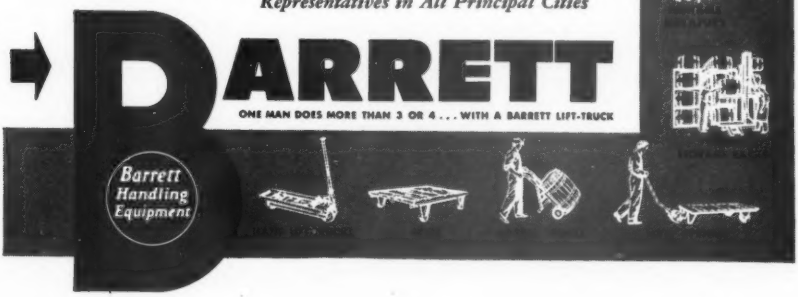


With the new BARRETT MULTI-DUTY DIE TABLE, one man does everything! Here's a lifting table, work bench, die separator, and floor truck—all in one—designed to save time and energy; cut costs in storing, moving and setting up dies. Note these outstanding advantages:

1. Makes die separation and assembly a simple, one-man job.
2. Handy crank-operated hoist does the heavy lifting.
3. Table is adjustable to height from 24″ to 40″ above floor.
4. All gears are accurately machined and fully enclosed.
5. Husky all-steel construction; electric welded, rigid.
6. Easy to operate; no complicated parts to give trouble.
7. Rolls easily on heavy-duty ball bearing casters.

Offered in two sizes with 44″ x 28″ and 36″ x 24″ tables; safe load capacities from 2,000 to 3,000 pounds. Write today for descriptive bulletins.

BARRETT-CRAVENS CO., 3269 W. 30th St., Chicago
Representatives in All Principal Cities

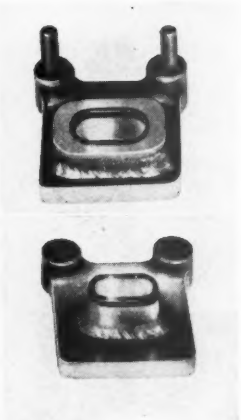


Eureka TOOL STEEL ELECTRODES

save vital tool steel for Victory

Eureka TOOL STEEL ELECTRODES

save time in Reconversion to Postwar Products!



RIGHT NOW we are all devoting 100% of our time to the winning of the war, and the Welding Equipment & Supply Company's Eureka Tool Steel Electrodes are doing their part by saving tons of *vital* tool steel, and countless man-hours. This savings is accomplished in the many industries where Eureka Tool Steel Electrodes are being used in the repair and maintenance of Tool and Die sections and the composite construction of new dies by welding.

When *peace* again prevails, Eureka Electrodes will play an equally important part in industry by helping to speed up the reconversion for postwar manufacturing by saving valuable time in the composite fabrication of new dies.

Illustrations at left show fabrication dies with Eureka Tool Steel Electrode deposits used as cutting edges.

★ *If you are making postwar plans now, we invite you to write us for complete information on Eureka Electrodes today.* ★

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WELDING EQUIPMENT & SUPPLY CO.

223 LEIB STREET • DETROIT, MICHIGAN

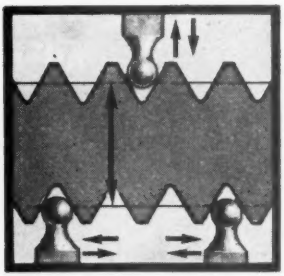
WHEN IT'S *Versatility* YOU WANT!

●Grinding—Sanding—Rotary filing—Polishing—Wire brushing—Drilling—many other operations—all done with one Haskins Flexible Shaft Machine. And done better, too—and faster. This is no single operation machine. In every metal working plant, machine shop, foundry and die shop, there's no end of jobs for Haskins Equipment. Get the most from *your* man-hours. Write for Catalog 45, showing many ways to speed production with flexible shaft equipment. R. G. Haskins Company, 625 So. California Ave., Chicago, Ill.

HASKINS
Flexible Shaft
EQUIPMENT
More VERSATILE Machines for
More PROFITABLE Work

MODEL 45B-100. The upper, sensitive roller contact actuates the Dial Indicator.

Positively, More Accurately and to closer tolerances



MODEL 45B-80. The upper, sensitive ball contact actuates the Dial Indicator. Both lower ball anvils float sidewise independently to compensate for any variation in lead.

No conventional type of gage, whether ring gage or roller-type snap gage, can tell you so **definitely** and so **quickly** the degree of accuracy of a pitch diameter as these two types of Dial Indicator Gages. Neither depend upon the uncertain sense of touch.

The roller type tells more than the conventional roller snap gage because the sensitive upper roller contact, reveals on the Indicator, just **how much** and **where** the pitch diameter may be wrong. The ball type simulates the three-wire method, but is faster. It is accurate to a tenth of a thousandth. Either type is incorporated in the adjustable Dial Indicator Gage shown below. For details write—

TWO FULL COLOR FILMS
(With Sound)
No. 1 DIAL INDICATORS
No. 2 DIAL INDICATOR GAGES
20 minutes each. For instruction and training. For showing write

FEDERAL PRODUCTS CORPORATION
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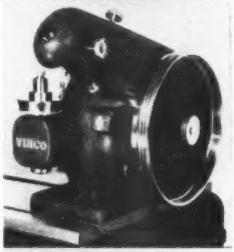
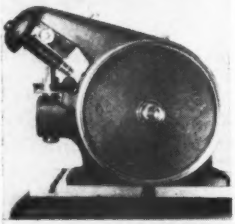
★ FEDERAL ★

PRECISION MEASURING INSTRUMENTS





"30 times more accurate"

For the past few years we at Vinco have been producing the Optical Master Inspection Dividing Head using the finest material and the best possible methods and workmanship in its production. We are informed, on high mathematical authority, that our Dividing Head is thirty times more accurate than others being used in inspection. The spindle in each instrument is carefully inspected and checked. The spindle run-out is guaranteed to within twenty-five millionths of an inch, total indicator reading; the average run-out however being approximately fifteen millionths. The Dividing Head is guaranteed accurate to within two seconds of arc, but experienced inspectors are able to match the lines viewed through the microscope to within 12½ millionths of an inch or ½ second of arc. It can therefore be seen that this Dividing Head operated properly is capable of great accuracy. Send for our folder.

VINCO CORPORATION
8873 SCHAEFER HIGHW'Y
DETROIT 27, MICH.

SALES OFFICES:
NEW YORK
CHICAGO

MILLIONTHS OF AN INCH FOR SALE BY VINCO

Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius Checker • Index Plates • Precision Vises • Sine Bars • Straight-side Splines • Serration Splines • Involute Splines and Helical Splines Plug and Ring Gages • Thread Ring Gages and Masters • Spur and Helical Master Gears • Munition Gages • Propeller Hub Gages • Built-up and Special Gages • Gear Rolling Fixtures • Splines and Index Fixtures • Hydraulic Power, Control, Utilization and Distribution Units • Engineering, Design and Development

Abrasive Belts Give Pressure-tight Seal

Some of the metal field cases for 50-caliber ammunition were not standing up to the pressure test when submerged in water. Try as they would, the makers couldn't get rid of this "headache" which occurred in a sufficient number of cases to make the whole operation slow and worrisome.

"Looks like a 'natural' for our waterproof abrasive belts on a wet-sanding machine. Got such a thing?"

They hadn't, but on the recommendation of our engineer were game enough to put one in and equip it with Speed-wet Durite Cloth (waterproof) belts.

Result? *Not a single failure! And in addition—100% increased output! The four edges met the lid in a perfect leakproof seal.*

The company was quite a user of coated abrasives; believed they knew all about them. Yet because of his many contacts with all kinds of sanding problems and the newest equipment for solving them, our man was able to recommend a machine and fit one of our many specialized products to their work with these gratifying results.

There's a strong possibility of similiar savings to be made on some of *your* operations. We will be glad to make a complete survey.

Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Grand Rapids, High Point, Indianapolis, Los Angeles, New York, Philadelphia, St. Louis, San Francisco, Tacoma.

Photos, Courtesy of The Belmont Casket Manufacturing Company, Columbus, Ohio.

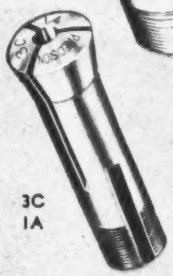
BEHR-MANNING • TROY, N. Y.
(DIVISION OF NORTON COMPANY)
Reliable Coated Abrasives Since 1872

WHEN COLLET WORK IS INDICATED - SPECIFY

Precision Collets

IMMEDIATE DELIVERY FROM STOCK

GUARANTEED UNCONDITIONALLY, AND AVAILABLE IN THE WANTED MODELS FOR MOST IMPORTANT LATHES INCLUDING SOUTH BEND, ATLAS, LOGAN, SHELDON, ETC.



MODEL 3AT for 10" Atlas, Logan, 12" Craftsman, No. 700 Powr-Kraft • MODEL 3C for 8 & 9" South Bend, 12" Clausing, Hardinge No. 3, 10" LeBlond, etc. • MODEL 1A for 8 & 9" South Bend • MODEL 5C for 9", 10", 16", 18" South Bend. Also Sheldon, Schauer, Sebastian 1" Capacity, etc. • MODEL 4C for 14½" South Bend. Also Sheldon, Hardinge No. 4, Elgin ¾" Capacity, etc. • MODEL 480 for Logan Screw Machine, Turret Lathe and attachments. Also Warner & Swasey No. 1, etc.

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GENERAL DIE-STAMPING-TOOL COMPANY

PRECISION COLLET DIVISION 265 Canal Street, New York 13, N.Y.

The forging of metal parts is and always has been the basic process in mechanical progress, whether in peace or in war.

Utmost strength and toughness with minimum weight is attained only in drop forging—more properly termed "impact die-forging." For it is the impact of the blow of the upper die on the hot metal resting in the lower die that gives to that metal the improved physical properties that fit it to withstand "unpredictable" loads and stresses.

Modern drop hammers—Chambersburg Hammers—have been responsible for the great progress in drop forging through (1) precision of operating mechanism, (2) increased ram velocities and (3) increased anvil-to-ram weight ratios.

Thus to the basic importance of forging has been added the refinement of scientific hammer design and manufacture.

Chambersburg Engineering Company
Chambersburg, Pennsylvania

Ex-Cell-O machine illustrated is an opposed Style 58 two-way machine arranged with six boring spindles at each end for finish boring, counterboring and facing the gear holes in an aluminum supercharger cover. All spindles operate simultaneously, finishing the holes within .0005" at a highly satisfactory production rate.

The units have 20 inches of table travel and 15¾ inches between the ways. Each spindle is individually adjustable for quick setting. In this particular application all centers are set to a master gage, which, in effect, is a master for the part itself.

INCREASING PRODUCTION . . .

with new economy!

XLO

EX-CELL-O *for* PRECISION

Ex-Cell-O Unit-type Precision Boring Machines Bring Added Practical Features

Ex-Cell-O has developed standard boring units, each a complete machine in itself, yet by means of heavy flanges and bolts these units can be bolted singly or in multiples to a stationary center section, resulting in a multiple precision boring machine. Note these advantages:

It is still a *precision* boring machine. Bores may be finished in tenths of thousands as before, yet units may be mounted in multiples and at angles, all operating simultaneously toward the center section.

Because all units may operate simultaneously, production is considerably increased on many parts.

The unit-type construction allows for salvage of all but the fixtures in case of part changes. It is possible and economical merely to remove and replace the entire center section. This means a flexible machine on which maximum production can be obtained while the machine is set up.

Each way or unit has two feeds and a dwell in forward and reverse direction, and each can be controlled individually or by a central control button in conjunction with all other units hooked into the electrical panel. It is completely automatic except for loading and unloading.

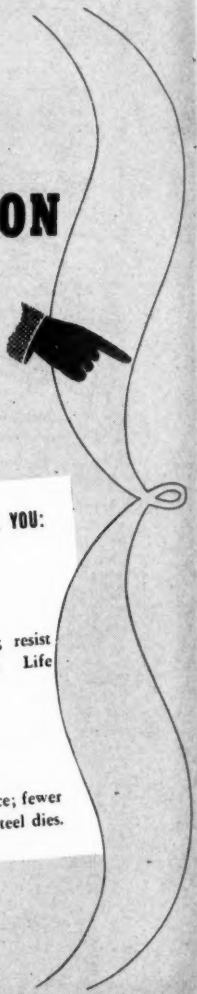
More than most semi-special machines, this Ex-Cell-O machine incorporates desirable features in flexibility and production, for war work today and peacetime products tomorrow.

Ex-Cell-O has just printed a new folder on Unit-type and other Way Machines. A copy is yours for the asking. Send to Ex-Cell-O Corporation, Detroit 6, Michigan, and specify Bulletin 31631.

EX-CELL-O CORPORATION · DETROIT 6, MICH.

PRECISION THREAD GRINDING, BORING AND LAPPING MACHINES · SPECIAL MULTIPLE WAY-TYPE PRECISION BORING MACHINES · SPECIAL MULTIPLE PRECISION DRILLING MACHINES BROACHES · GRINDING SPINDLES · HYDRAULIC POWER UNITS · DRILL JIG BUSHINGS TOOL GRINDERS · CONTINENTAL CUTTING TOOLS · DIESEL FUEL INJECTION EQUIPMENT PURE PAK CONTAINER MACHINES · R. R. PINS AND BUSHINGS · PRECISION PARTS

MEET YOUR POST-WAR PRODUCTION DEMANDS WITH Firthite!



FIRTHITE SINTERED-CARBIDE PUNCHES AND DIES WILL GIVE YOU:

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Less burring, distortion, and buckling; more uniform accuracy; better finish—smoother edges and surfaces.

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Edges stay sharp longer; resist chipping and breaking. Life multiplied many times!

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Less idle time for changes.

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Lower cost of maintenance; fewer resharpenings than any steel dies.

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FIRTHITE PUNCHES AND DIES FOR:

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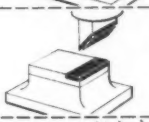
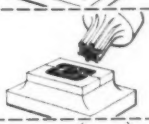


★ **SHAVING**



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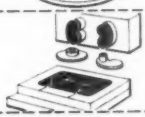

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also laminating, burnishing, curling, piercing, crimping, planishing, broaching, swaging, etc.

Please furnish this information when you request quotation on Firthite Punches and Dies:

Assembly blue print of present method;
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Description of material punched;
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ARMY-NAVY "E"

Firth-Sterling
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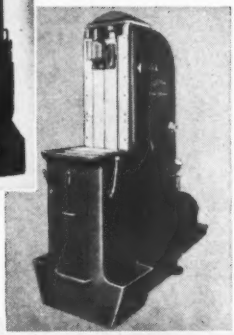
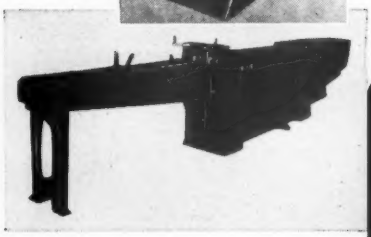
THIS AIRCRAFT ENGINE PLANT DOMINATES

it's All-American Team





So high is the production-with-precision obtained by broaching that one machine is ample for most metal working plants. Few have as many as 10 or 15.

Consider, therefore, the importance of this particular aircraft engine plant in the broaching picture, with 91 American machines!

Their personnel *knows* broaching. They know the value of dealing with an old-line company whose principals have been identified with broaching since the turn of the century. They know, too, the importance of a *complete* broaching service—machines, tools, and engineering — for winning war production, profitable post-war production.

Significant is this overwhelming vote of confidence in American Broach equipment.

BROACHING IS BETTER THE *American* WAY

American

BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN

BROACHING MACHINES
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SPECIAL MACHINERY

DIVISION OF

Atlas 10-INCH LATHE
CONDENSED SPECIFICATIONS
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16 Spindle Speeds 28 to 2072 RPM
Thread Cutting Range 4 to 96 per in.
Four Bed Lengths 18" to 36" centers

Precision for Invasion . . .

When the day comes and our boys pour ashore for the last big smash, accuracy born on the production line will give them the winning punch. For precision-wise industry has been satisfied with nothing less than the best in the quality and quantity of American weapons.

In thousands of war plants where Atlas Machine Tools are specified, they have increased production "firepower" *by taking over production of small parts so that capacities of larger machines were not wasted.*

The Atlas Lathe, quickly converted for hand screw machine work, has proved its ability to deliver split-hair precision under the most grueling production schedules. Massive precision-ground bed, reversible automatic power cross and longitudinal feeds, quick-change countershafts, and custom built spindle bearings are but a part of the story of its modern, compact design.

The low-cost Atlas 4 Tool Team for Victory will be a combination equally hard-to-beat in peace. You can use it for extra production right now . . . for quick conversion later. Write for full details and the address of our nearest representative. Atlas Press Company, 212 North Pitcher Street, Kalamazoo 13D, Michigan.

Accurate Threads — START WITH ACCURATELY ENGINEERED DIAMONDS . . .

TRU-THREAD DIAMOND DRESSING TOOLS ARE ACCURATELY ENGINEERED TO YOUR JOB!

TRU-THREAD tools embody a radically new idea in the *manner* in which the diamond is used. This new idea employs the natural hardness of the uncut stone to achieve accuracy, speed, durability and economy that are truly remarkable.

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For use on
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JONES & LAMSON
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and other thread grinders

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For forming wheels that grind
WHITWORTH
BUTTRESS
ACME
U S S
and any special form groove or standard thread.

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TRU-THREAD tools cut faster and forms are obtained more quickly. They cut cleaner, leaving the grits sharp and the grain open, creating a free-cutting wheel that holds its form longer. Down-time is reduced, fewer dressings are needed and many more pieces are ground between dressings. Production boosts have gone as high as 500%—and grinding cost per piece has dropped as much as 75%.

There is a TRU-THREAD tool made to dress *any* form —straight line, radial or multiple and each with equal accuracy—the accuracy that is engineered into them in our plant.

These new tools are now being made and reserviced on a production basis, assuring you fast deliveries. Write, wire or phone.

WHEEL TRUEING TOOL COMPANY
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PRICES DOWN 25% ON SUPER CARBOLOY TIPPED Milling Cutters!

Here's money-saving news for production men! A 25% price reduction on Super Carboloy Tipped Standard Milling Cutters! Think of it! Now you can get the speed, accuracy and dependability of these high quality cutters at prices that mean *extra* economy on all types of production jobs . . . . long runs, short runs, even general shop tooling.

How is this price reduction possible? You'll find the answer in our plants—engineering research and development, improved manufacturing techniques, increased production. And we are passing these savings along to you.

If you haven't yet tried Super Carboloy Tipped Milling Cutters, now is the time to do it! You'll learn first-hand why production men the country over who are interested in stepping up production and stepping down costs, specify SUPER. Write TODAY for complete details as to descriptions, sizes and new low prices.

All sizes available from stock for immediate shipment

SUPER TOOL COMPANY

Carbide Tipped Tools

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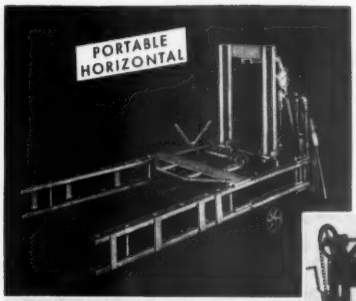
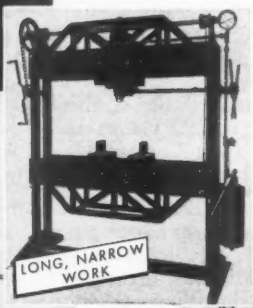
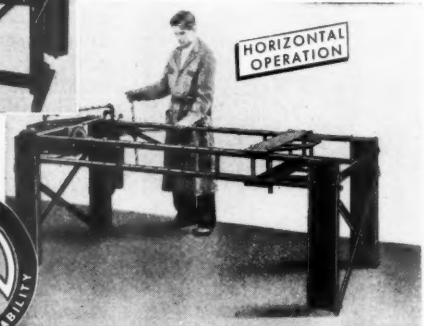
KRW *offers* VERSATILITY *and* ADAPTABILITY *in* HYDRAULIC ARBOR PRESSES



It took War's demands for speed and more speed to demonstrate the unusual versatility and adaptability of the KRW Hydraulic Arbor Press. In many cases, when other equipment was not immediately obtainable, we were called on to adapt our hydraulic arbor presses to save the day productionwise. Illustrated here are some of the results that have been achieved. All of these special presses incorporate the time-proven features of the standard KRW Hydraulic Arbor presses. They are now available . . . *BUILT TO ORDER* . . . for *2 to 3 week delivery* on all orders carrying a priority of AA-4 or better. If you have a problem that a special design press might solve, call us now. Write for our new bulletin describing KRW Hydraulic Presses in 25, 50, 60 and 75-ton capacities.





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K. R. WILSON
10 LOCK ST., BUFFALO 2, N. Y.

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STANDARD DIE SETS
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DIE MAKERS' SUPPLIES?
Call "DETROIT"

The wartime growth of our business is due not only to the general increase in metal-working activity but also to our genuine desire to serve the best interests of every customer, and help solve their production problems. We invite your inquiries regarding standard and special die sets, all steel and semi-steel, dowel pins, cap screws, die springs and other accessories.

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DETROIT
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THESE are the quality features you get with every Standard Carboloy Tool:

Cold drawn steel shanks—with the strength to "take it" on even the "toughest" jobs. Full-size Carboloy Tips—amply large to permit grinding to wide range of special shapes. Extra-strong braze—copper braze—of tip to shank. Cutting rakes and angles accurately incorporated for wide range of work. Each tool diamond-ground, ready to *start* cutting and *keep* cutting for long periods of operation. Entire tool shank area colored for instant, unmistakable identification.

These and other quality features of Carboloy Standards are available to you at prices comparable to all types of cutting tool materials—prices made possible by unprecedented demand and mass production economies.

Stocked in 10 styles, wide range of sizes and five standard grades.

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For Cutting CAST IRON and Non-Ferrous Metals
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TUNGSTEN CARBIDES ★★★ TUNGSTEN CARBIDES WITH TANTALUM AND/OR TITANIUM CARBIDES

U. S. Signal Corps Photo

The Man at the Lathe Fights Too!

...and every turn of the spindle, as he guides his work through many precision operations, helps bring Victory one step closer.

Hours spent at a lathe may lack the dangerous excitement of combat—but the valorous men on the battle fronts breathe a prayer of thankfulness for guns, shells, planes, tanks—for all the superb equipment which is helping them swing the tide against the Axis.

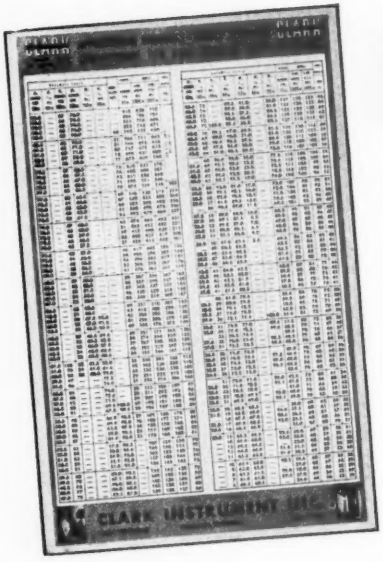
So the man at the lathe is a soldier, too, as he bends his shoulders to the task of pouring out weapons in an ever-increasing stream. He faces his task grimly ...proudly...proclaiming by the gleam in his eye and the jut of his jaw that he will not be outdone in service to his country, and knowing that America's production is a decisive factor in the war.

To help America "tool up for Victory," the output of South Bend Lathes has been increased (we can't say how much) in the last year and a half —giving the man at the lathe the efficient, dependable production weapon he must have to win.

There is a South Bend Lathe for every class of work—engine lathes, toolroom lathes, and turret lathes. Write now for our new catalog No. 100C in which the entire line is illustrated and described.

SOUTH BEND LATHE WORKS

South Bend 22, Indiana *Lathe Builders for 37 Years*



FREE!

THIS 24" x 32" WALL CHART GIVES ROCKWELL... BRINELL... SCLERO... VICKERS HARDNESS AND TENSILE STRENGTH CONVERSIONS...

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● If you are a production executive whose responsibility includes the hardness testing of metals, you will certainly want one of these new charts for your office, shop, or laboratory. Handsome in appearance, printed in three colors, with the very minimum of advertising, it will prove its value every hour of every day. Type is large, easily read at a distance of several feet, yet the chart itself is only 24" wide and 32" high — about the size of a calendar.

Although a chart like this is relatively expensive to produce, and the quantity is rigidly limited, a copy is yours — free for the asking — if you request it on your letterhead. Write Dept. TD, CLARK INSTRUMENT INC., 10200 Ford Road, Dearborn, Michigan.

CLARK

TOMORROW'S ACCURACY TODAY

HARDNESS TESTER

Heat Treat Your Own Small Parts...

SAVE TIME AND MONEY THESE 5 DIFFERENT WAYS

This small compact electric furnace is inexpensive, handy and easy to operate—ideal for small tool and die shops—saves time these five different ways:

1. Eliminates delays in sending small machine parts out to overcrowded commercial heat treaters.
2. Saves time and expense of drawing or tempering small metal parts in large furnaces.
3. Cuts handling time when normalizing or annealing small parts. No waiting.
4. Conveniently available for pre-heating for subsequent high-speed hardening.
5. Eliminates shut downs and delays in servicing emergency repair orders.

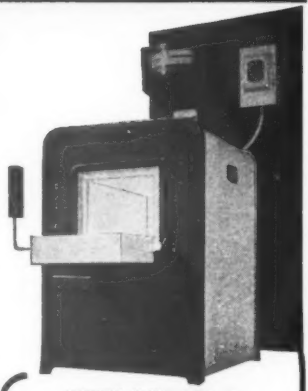
AVAILABLE IN TWO SIZES

Type	*Chamber Capacity*	*Amps 115 V*	*Watts*	*Amps 230 V*	*Price*
MH-3	8″W 6″H 14″L	29.6	3400	14.8	$124.00*
MH-4	10″W 6″H 18″L	....	4800	20.9	$191.00*

**Includes Hearth Plate*

MAX. SAFE TEMPERATURE—Continuous operation, 1750° F.; Intermittent operation, 1850° F.

AUTOMATIC CONTROL—Indicating Controlling Pyrometer—Thermo-couple and lead wire complete—$152.40.



REPLACEABLE HEATING ELEMENTS

Replaceable nickel chromium resistors embedded in rectangular refractory blocks. Elements form inner walls of furnace chamber, and may be replaced easily and quickly after removing rear panel — furnace structure remains undisturbed.

FREE—Complete data covering specifications, additional applications and ordering instructions are included in this new folder. Write for your copy today. Ask for Bulletin No. 50.

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32 SOUTH SHELBY STREET • INDIANAPOLIS 7, IND.

INCREASED PRODUCTION! MORE ACCURATE WORK . . SUPER-SMOOTH FINISH

with the SUNNEN "MA" PRECISION HONING MACHINE

On internal cylindrical surfaces from .185" to 2.625" in diameter, the Sunnen Precision Honing Machine will handle production jobs to within .0001" limits — and produce a super-smooth finish of 2 to 3 micro-inches. In actual practice, jobs have often been held to .000025".

And, in addition, production has been increased — in some instances, up to 500%. Skilled labor is unnecessary. No jigs or fixtures necessary. Can be set up in less than one minute. Write for free bulletin giving complete information.

SUNNEN PRODUCTS CO., 7947 Manchester Avenue, St. Louis, Mo.

Canadian Factory: Chatham, Ontario

The coveted Army-Navy "E" waves over the Sunnen plant—evidence of the important part Sunnen equipment is playing in the war effort.

SUNNEN

On Jobs Like These!

Carbureter Idler Valve Jet. Hole is honed after reaming for smooth action.

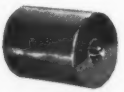
Roller Bearing Outer Race. Finish improved from 12 micro-inches to 2 micro-inches.

Bearing. A very small part. 2 micro-inch finish necessary.

Carbureter Idler Pump. Smooth, straight-line finish in blind hole prevents piston leakage.

Hydraulic Metering Valve Stem. Hole .156" in diameter; reamed, heat treated, and then honed. Honing 3 times as fast as previous method.

Aircraft Instrument Panel Control Wire Bushing. Hole .187" diameter — held to .0002", stock removal .001", sixty per hour.



Header Die. Life of header dies increased 3 to 9 times over lapping. Knock out pin breakage practically eliminated.

Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping—and gave a straighter hole.

Cast Iron Valve Stem Guide. ½ to one thousandth removed —220 pieces per hour. Better finish and straighter hole.

Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit.

Shell Loading Die.

Idle Valve Guide. Honing after grinding holds a .0002" limit necessary for accurate idling.

Hydraulic Control Bushing. Honing gives straight round hole after rough reaming.

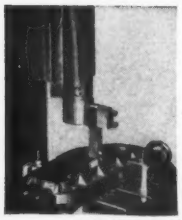
Aircraft Carbureter Operating Valve Sleeve. Sunnen honing eliminates distortion from assembling operation.

Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.

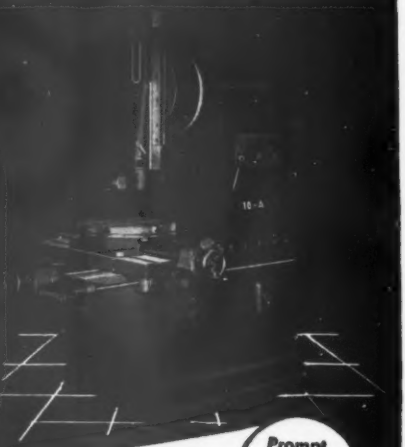
Compressor Yoke. Alignment maintained and better finish produced.

DOUGLAS *Precision* MACHINES

The Douglas Precision Slotter is adaptable to both tool room and production work. Swiveling ram head with tool holder and rotary table often solves the problem of costly fixtures. Automatic feeds in all directions — 7" to 10" stroke.



Typical production parts machined on a Douglas Slotter.



FOR TOOL ROOM AND PRODUCTION

Prompt Delivery to War Plants

The Rotorex Universal Tool and Cutter Grinder will accurately perform all kinds of tool grinding operations. Readily interchangeable attachments are available to set up machine for single-purpose jobs such as cylindrical, internal and radius grinding.

Operation showing set-up for internal grinding.

Operation showing set-up for sharpening straight gash hobs.

DOUGLAS MACHINERY CO., Inc.

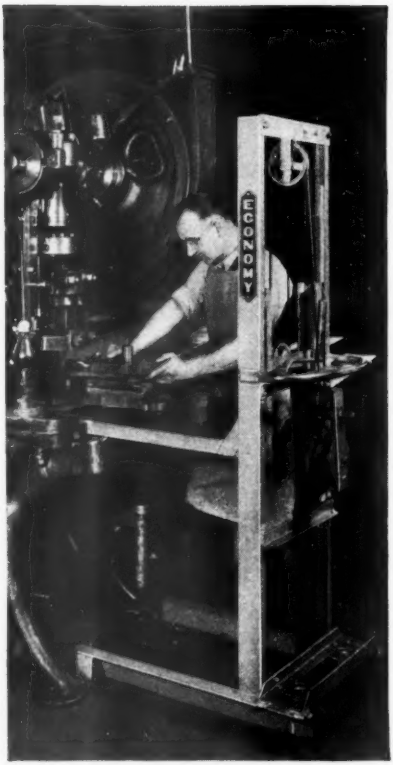
150 BROADWAY • NEW YORK, N. Y.

SAVE PRODUCTION TIME

with a

SHOPLIFTER

One man can handle heavy dies alone. Not necessary to stop other machines to get help.



MORE production per day from your machines if a Shoplifter is handy to do the heavy job of moving dies from storage racks to the press. In these times when maximum production of machines is of vital importance, much time and labor can be saved if the operator can handle the heavy work of changing dies without calling for help from other operators.

The Shoplifter is built for this job. Dependable and safe with a rated capacity of 500 lbs. (heavier machines up to 5000 lbs. can be furnished). Entire machine built of structural steel. Electrically welded throughout. Platform lifts 54" above floor and lowers to within 5½" of floor. Overall height 72". Size of platform 24"x24" wood deck. Crank, up and down, hoist unit.

ECONOMY ENGINEERING CO.
2659 W. Van Buren St., Chicago, Ill.

Price **$147.50**

IMMEDIATE DELIVERY

The AUTOMETRIC

18" and 24" English Measure

VERNIER HEIGHT GAUGE

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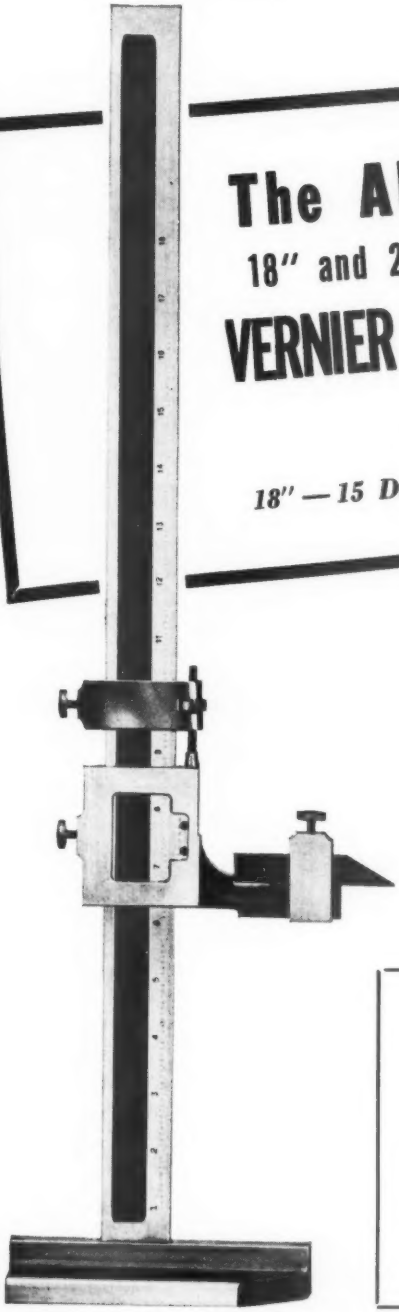

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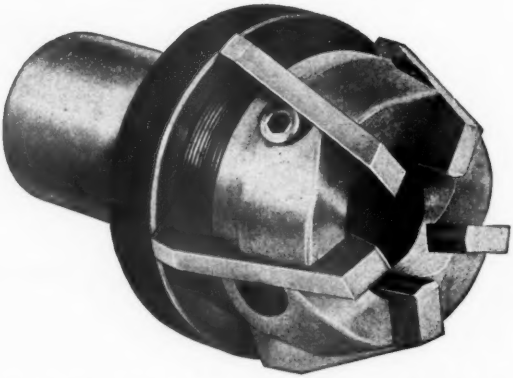

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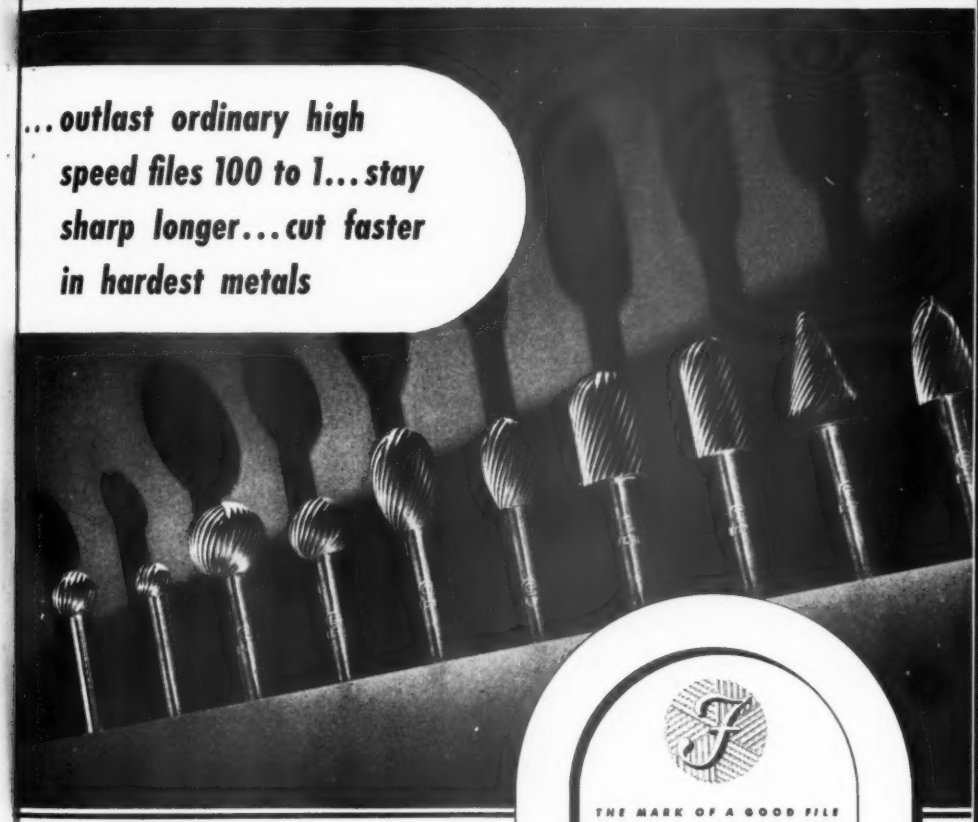
...outlast ordinary high speed files 100 to 1... stay sharp longer... cut faster in hardest metals



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Hand Cut
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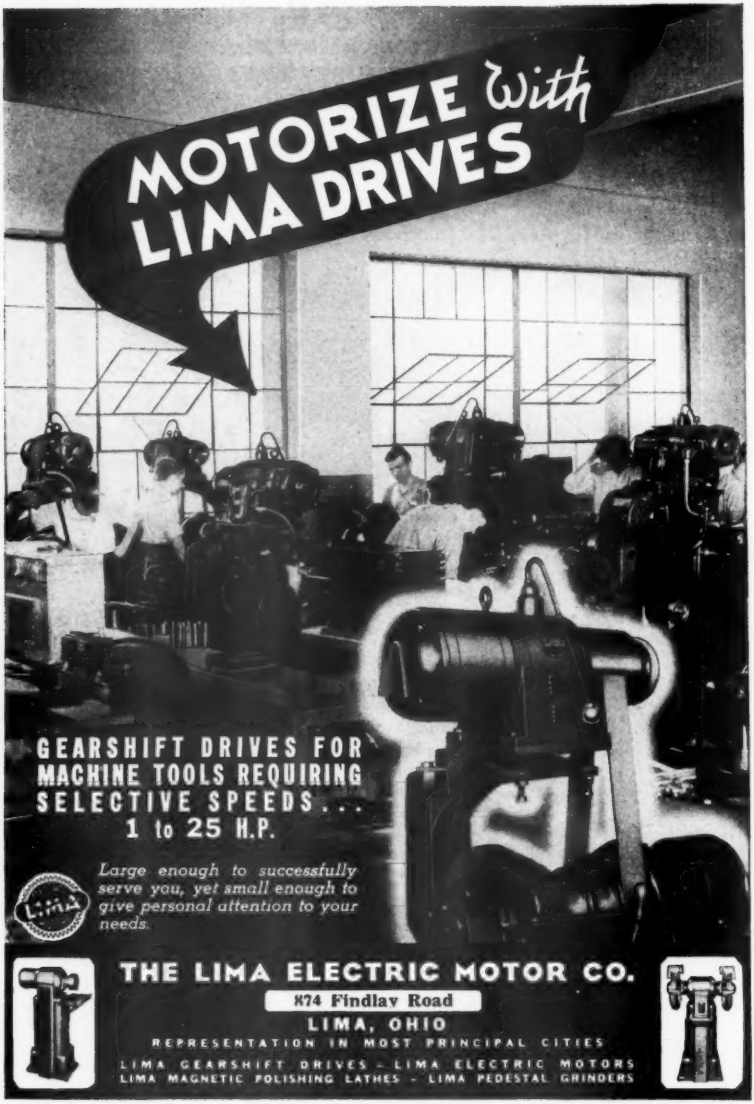
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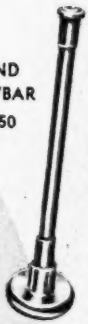

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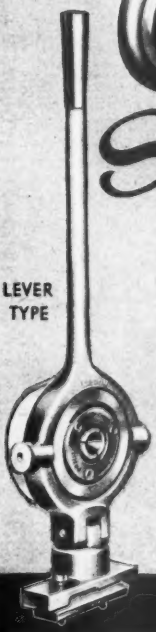

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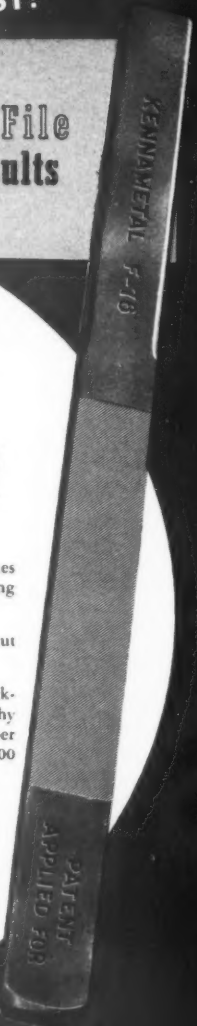

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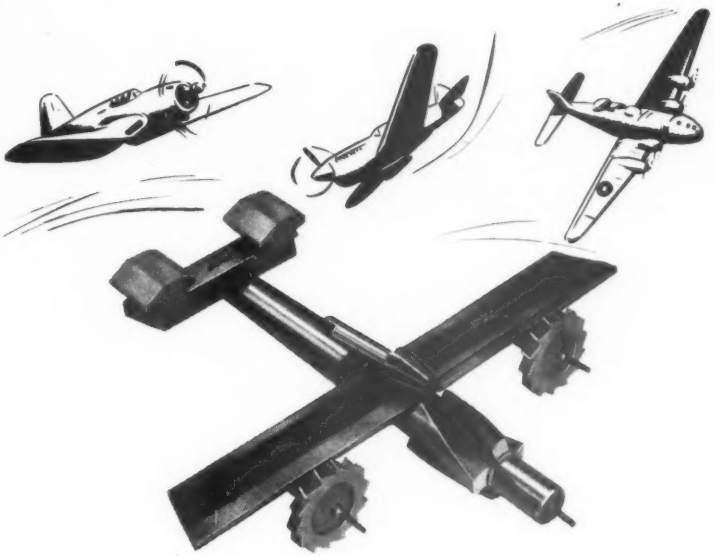

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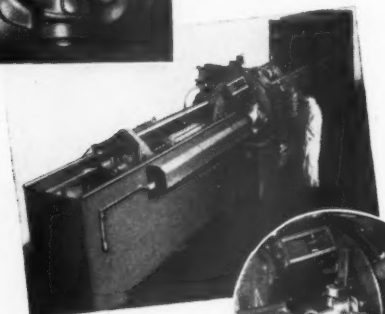
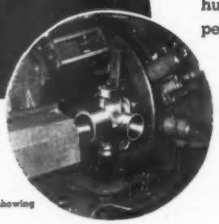
THE PIECE OF PAPER
that broke a bottleneck

Close-up of completed propeller hub.



The Lapointe HP-150 which broaches 2 propeller hubs at one time.



Close-up of loading position showing hydraulic fixture.

"Work plan — 1776-D1" was the appropriate nomenclature for the machine and broaches which today are making production figures unbelieveable a few short months ago. They are the chief bottleneck breakers in putting out spline propeller hubs for a new type aircraft propeller. Made of especially hard steel, these new propellers could be turned out in mass production with the precision tolerances desired only by broaching. Exact production figures are a secret but hub splining is no longer the bottleneck.

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AND PRECISION, PRELOADED BALL BEARING HEADSTOCK

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3 BEARINGS IN REVERSE GEAR BRACKET
11 BEARINGS IN GEAR BOX
6 BEARINGS IN HEADSTOCK
9 BEARINGS IN AUTOMATIC APRON
4 BEARINGS IN CARRIAGE ASSEMBLY

*Arrows indicate location and number of self-lubricating bearings in Logan Quick Change Gear Lathe. All Logan Lathes are similarly protected.

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Logan No. 200 Back Geared Screw Cutting Lathe with Self-Lubricating Bronze Bearings at 23 Points

Logan No. 850 Manufacturing Turret Lathe with Self-Lubricating Bronze Bearings at 19 Points

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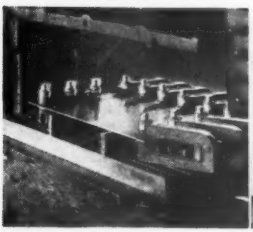
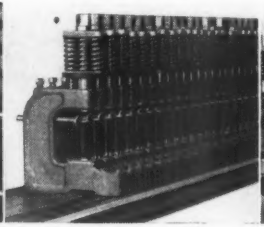
Wales Type "B" Units for punching sheet material in stamping presses.



Wales Type "C" Units designed for punching angles and sheets on press brakes.



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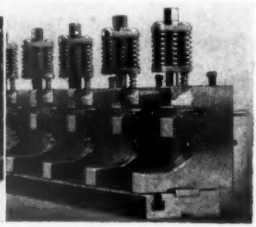

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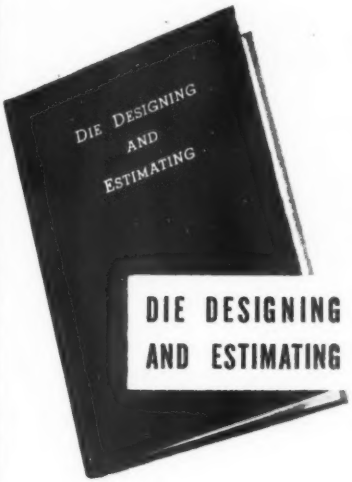

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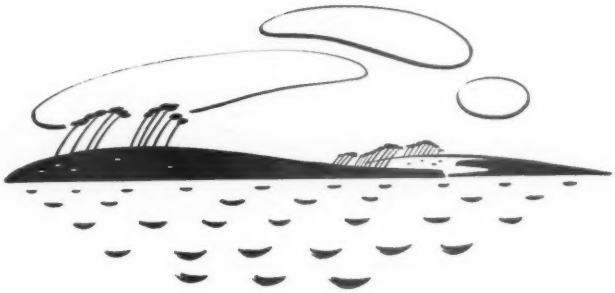
THEY BOUGHT THEIR BEACH-HEAD



TODAY I walked with heroes. They looked like your sons and mine, like your brothers and mine. And they behaved like men who had dedicated themselves to a great purpose, a great cause—so great a cause they had the courage to face death for it.

The taking of the beach-head that day was particularly hazardous. Not only was the landing force under terrific fire continuously, but it seemed that wind and wave were likewise determined to take their toll. Landing ships and barges stranded on reefs. Some capsized; others were set afire by enemy shells. Tanks, guns, ammunition and men were thrown into the sea.

Despite these terrifying circumstances, your boys and mine swam or waded ashore. If a man's feet touched bottom and left his head above water he carried something critically needed for immediate use on the beach—a gun part, a box of ammunition, a case of medical supplies. Try some day to keep your balance in shoulder-high breakers while you carry fifty pounds above your head. They slipped and fell, too, and many because an enemy bullet found its target.

With incredible coolness and courage, aye, and speed, the boys who reached the beach dug foxholes, set up machine guns and began to answer an enemy who was having almost everything his way. I saw boys who must have been sprinters in high school or flying tackles on a college football team tear across the open beach to the so-called shelter of a strip of anemic-looking palm trees and get their rifles or semi-automatics into telling action.

All of this I saw as I sat with equally comfortable friends after we had enjoyed a warm, well-cooked meal. But I had been transported to that far-away South Sea island and for an hour I saw the hellish destruction wrought by only a small piece of this world-wide war—the destruction particularly of the fond hopes and promising futures of American boys who had sailed

away from their "Land of the Free" and were proving that it is also the "Home of the Brave." They were willing to die for their country, but make no mistake, they did not want to die any more than do you or I. I watched them in action and I wondered if I would have the courage to do what I saw them doing, both against our enemy and for each other when they fell under fire.

Then I thought about my contributions to the winning of this devilish man-made war, and the contributions of others. I remembered that we have been working long hours—ten, twelve, perhaps fourteen. And I said to myself: "So what? You did it at home, in safety and in comfort, and you were paid for it! And you could spend the money for what you needed and most of the time for what you wanted."

Then I had my last look at the battle. The beach-head had been won. From inland and from up and down the beach came the heroes, the carried and the carriers. The wreckage along the beach was awful. Guns, tanks, supplies, ships and men—wreckage lay everywhere.

And as the picture was ended the narrator thanked us—even you and me—for building those tanks and guns and ships so those boys could take that beach-head.

Perhaps your thoughts right now are not unlike mine.

Our Country's War Bonds are an *investment*; strictly speaking, you do not *buy* them. They are a means for *saving*, not an *expenditure*.

The Fourth War Loan Bond Drive is scheduled to end February 15, but we have it from Secretary of the Treasury Morgenthau that all the extra bonds we subscribe for until February 29th will be included.

Editor

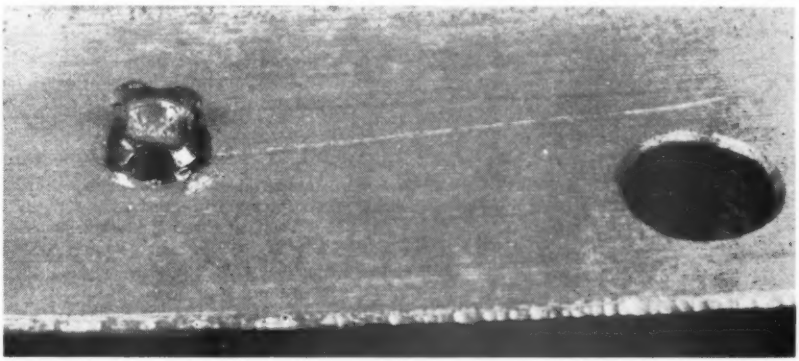
REMOVAL OF BROKEN TOOLS FROM MACHINED PARTS BY THE ELOX METHOD

by H. V. Harding
GENERAL MANAGER
Elox Corporation

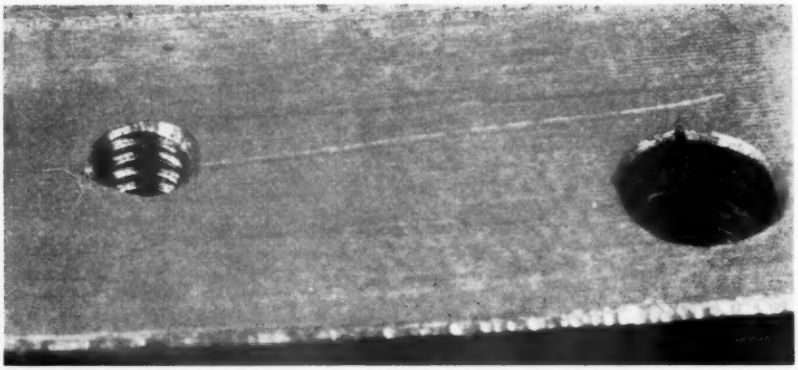
PARALLELING the drilling, reaming, and tapping of holes in metal has been the vexing problem of attempting to remove the broken parts of the tools which, for many reasons, frequently snap off in the work. With improvements in metal refining and the constantly increasing number of alloys broadening the field of metallurgy, the manufacturers of taps, drills and reamers have also improved their materials and bettered their design to keep pace with this expansion. With the increase in hardness and toughness of metals and alloys, still harder (and hence more brittle) tools are required to work them. This increases the hazard of breakage, even in the hands of skilled mechanics. Increased cutting speed is also a contributing factor.

The war has brought an unprecedented acceleration to the alloying, refining and precision working of metals. Precision work and exacting tolerances are demanded which were undreamed of a few years ago. Much of this has had to be done by relatively unskilled workers. Because of this, the toll of expensive and urgently needed war parts which have had to be thrown back into the furnace because of broken tools which could not be removed reaches staggering figures in dollars. More important still, it represents precious man-hours which are a measure of a nation's war effort.

The time-honored methods for removing broken tools are largely memories of the past. Precision threads and close-tolerance holes, made to stand the utmost under the stress of battle, must not be mutilated by mechanical devices probing and twisting to "back out" the offending drill or tap. Hollow milling and plugging, acid treatment or welding is not allowed unless there is a wide margin of strength in the part. Annealing, drilling and re-hardening are largely frowned



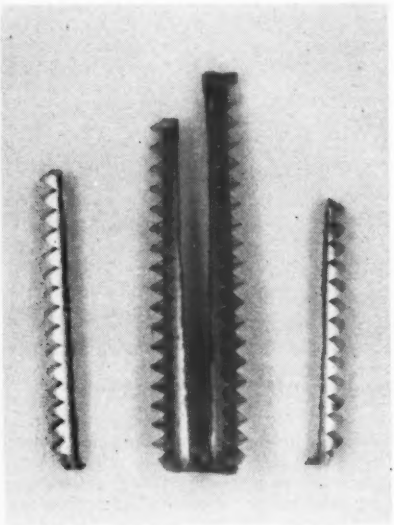
A sad and too familiar sight. The stub of a broken tap protruding from hole.



A more welcome (but rarer) sight. The same hole, after tap has been removed by Elox disintegration. Note undamaged condition of threads.

upon, both from the cost angle and because of the danger from distortion, internal stresses and weak spots.

Losses through broken tools have been accepted as inevitable by many manufacturers and a percentage of breakages is begrudgingly allowed. They know, from experience, that, despite many efforts in the past to devise ways and means for extraction (such as acid, mechanical extractors, etc.), the old problem lies in the background like a spectre which cannot be fought with any tangible weapons.



The guilty so-and-so. Rows and sections of cutting teeth are easily removed from the hole after "disintegrating" the center core.

The engineers of the Elox Corporation of Detroit have found a solution to this problem. In their experimental shops many thousands of "ruined" parts, including aluminum gun turrets, magnesium parts, gun breech rings, etc., have been received from some of the largest manufacturers; the broken tools have been removed and the parts returned to production without any harm to threads, holes or metal structure. With this radically new invention there is no annealing, distortion, electrolysis or mechanical abuse.

The operation of the machine is simple. As shown, it is fully portable. It consists of two units in metal boxes which can easily be carried by one person. The balanced electrical unit is so designed that it can be kept available in a tool crib or mounted on a drill press frame as a permanent fixture. The disintegrator head can be removed from its box and fastened in the drill press chuck as a drill or other tool would be. All that is necessary is a water connection (a circulating pump can be used if necessary) and an electrical convenience outlet.

The work having the broken tool is clamped to the table of the press and the proper size disintegrator electrode is centered on the tool in much the same manner as when setting up for drilling a hole. The machine does not revolve.

When water and electricity are turned on and the electrode is brought into contact with the work, disintegration begins and continues down through the center of the broken tool stub until the center or core is removed. When the bottom of the hole is reached, the lengths of cutting teeth, as shown in the photograph, are all that remain. These can be easily picked away from the wall. Large taps may be removed by "disintegrating" two or more rows of teeth whereupon the body of the tap will fall out. Drills and reamers are removed by following the same procedure.

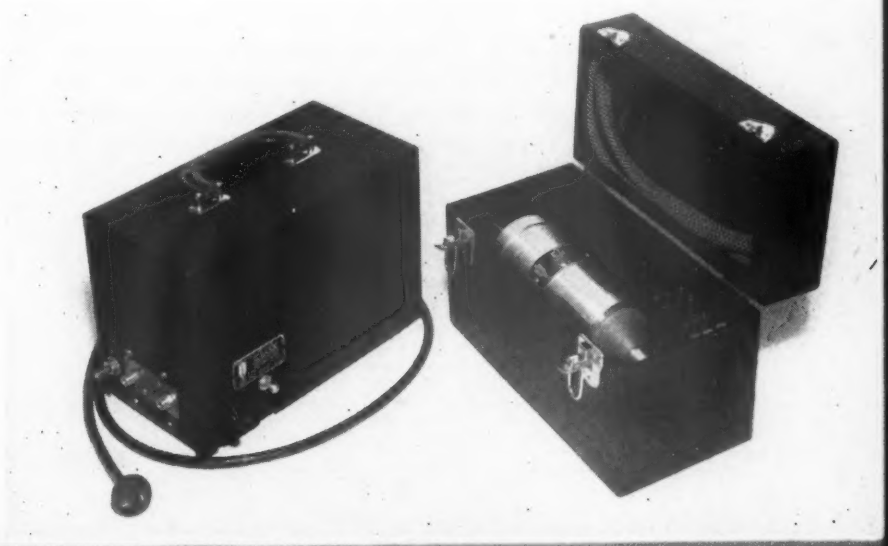
The principle is largely one of oxidation. The machine is so devised that, through the ELOX method, the terrific acceleration of an ordinarily lengthy process results in relatively fast disintegration without the nuisance and danger from heating that might be expected. As every mechanic knows, there are many different conditions encountered, such as blind and through holes, holes packed full of cuttings, shattered tools, etc. This varies the time required to clear a hole. A fair average covering all conditions would be a disintegrating speed of $\frac{1}{32}$" per minute. Only those who have stood over a finished part for long hours in trying to remove a broken tool, possibly only to admit defeat when the hole was finally too badly mutilated to pass inspection, can realize what this means. The process is time-tested and fully successful.

Other uses have been found for this machine and process. For instance, it is feasible to "break" the hard skin of case-hardened parts to permit working with conventional tools. In hardened steel parts, such as molds, dies, fixtures, etc., holes which might have been forgotten before heat treating or subsequently required due to specification changes can be "drilled". This is a somewhat slower process but has proven its worth many times because it does not anneal and it saves reworking of the part.

The method is safe and the machine can be operated by anyone who can "center" on a tool and set the drill press spindle. Extremely low voltage is used and there is no danger from a short circuit or the high current. Certain characteristics, built into the machine, obviate the necessity for complicated control apparatus, cut down the need for costly maintenance and thus make the machine and operation simplicity itself.

The inventors of this machine and method feel that an age-old problem has been effectively solved and are gratified that this development has come at an opportune time when the country and the hard-pressed manufacturer most need it.

The complete Elox disintegrating equipment is contained in two compact carrying cases.



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TOGGLE LEVER DRILL JIGS

C. W. Hinman
Designing Engineer

TOGGLE lever drill jigs are quick action tools. One movement of a handle locks or unlocks the bushing plate, and the unlocking operation also automatically elevates the plate for removing the drilled work and for inserting the next piece. In Fig. 143 is shown an improved design for one of these jigs. The tool parts are of steel and are welded in place, which is a construction method both speedy and cheap.

In the drawing, *A* is the base, *B* the bushing plate, *C* a spiral cam lobe, *D* drill bushings, *E* an equalizer or runner clamp, *F* guide pins, *G* guide pin bushings, *H* the handle, *J* nest plate, *K* toggle lever, and *W* is the work. Point *O* is the fulcrum center about which the surface of the spiral cam lobe *C* is milled by setting up a spiral head attachment on the table of a universal milling machine.

An eccentric cam lobe does not lock properly and becomes easily desengaged by machine vibrations. However, the cam lobe used in this tool design has a spiral rise, like those used for automatic screw machine cams. It will lock runner clamp *E* at any clamping point on the periphery of the cam and hold it securely at the locking point. For this reason, the cam clamping element here compensates for variations in the thickness of the work if it does not exceed the height of the spiral rise on cam lobe *C*.

Figures 143 and 144 indicate the operation of this tool. When handle *H* is pushed forward toward "locking", toggle lever *K* forces bushing plate *B* down on

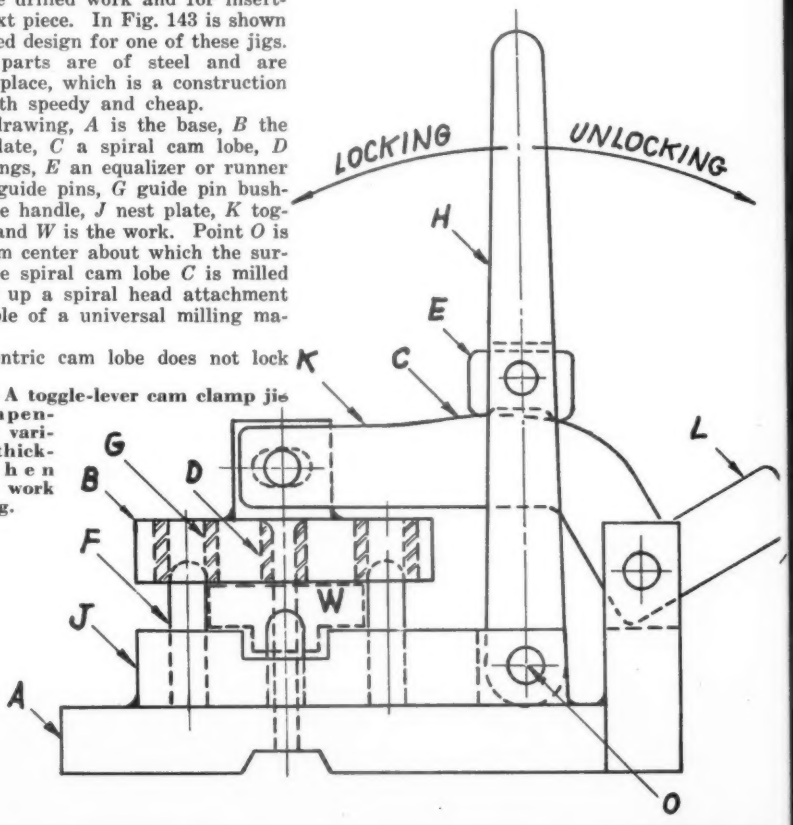


Fig. 143 — A toggle-lever cam clamp jig that compensates for variations in thickness when clamping work for drilling.

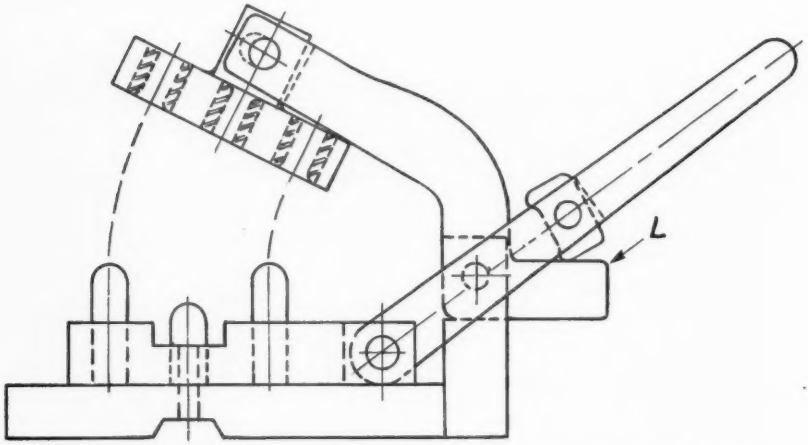


Fig. 144 — The jig, shown in the preceding figure, has been opened and the drilled work removed.

the work until the thickness of the work retards the handle movement, and in that position runner clamp *E* locks the handle on the cam. After drilling, the handle movement is reversed toward "unlocking", this action releases the work, and continued movement of the handle actuates lug *L* of toggle lever *K*, which lifts the bushing plate and permits removing the work and inserting another piece.

Figure 145 shows a steel channel section *W* clamped in a vertical toggle lever jig for drilling holes through the channel legs. Methods for positioning the work in these jigs can be varied to suit the size, shape, or condition of the piece. The operation of this jig and the identification of the functional parts are the same as for the one in Fig. 143. Variations in design could involve a positive stop at one end of the work and a clamping screw at the opposite end. It might be necessary to centralize the work endwise or to locate it over studs by means of holes which have previously been punched, drilled or bored in the work.

There are many types of efficient hand clamps and toggle lever clamping units which have been standardized and manufactured commercially. Among them are those made by the Detroit Stamping Company and Knu-Vise Incorporated, in Detroit, Michigan. These clamps are used for holding parts to be welded together, for drilling, milling, and tapping, as well as for many other purposes where parts must be positioned prior to assembling. They are also used for many operations in airplane assemblies but this article is confined to uses in connection with drilling operations only.

When designing jigs for drilling or tapping very small parts, such as those used in small gun locks, meters, relays, computing machines, typewriters, instrument boards, and similar equipment, the size of the jig body should be designed relatively larger than is otherwise usual. The increased proportions provide the operator with a jig convenient to handle, one that can be loaded and unloaded faster, and one that is easier to place and hold against stops on the drill press table.

However, for drilling small work, or for holding drill jigs that have been designed too small, a special clamping plier is used, as seen in Fig. 146. This small jig is for drilling one No. 60 drill size hole (0.040″) through one end of a piece of work which is a short round steel rod. The hole for loading the work is shown in the front end of the jig body. Clamping the plier across the jig and work prevents the jig from rotating with the drill when holding the plier by

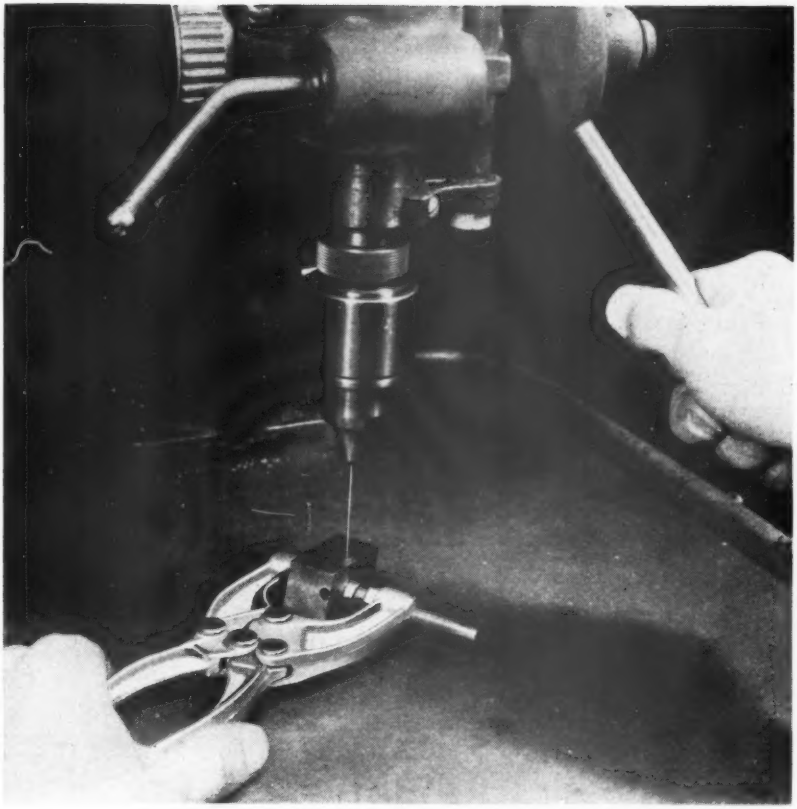


Fig. 146 — A pair of Knu-Lok pliers for holding a small jig and workpiece in a firm position while drilling small holes. (Courtesy Knu-Vise, Inc., Detroit.)

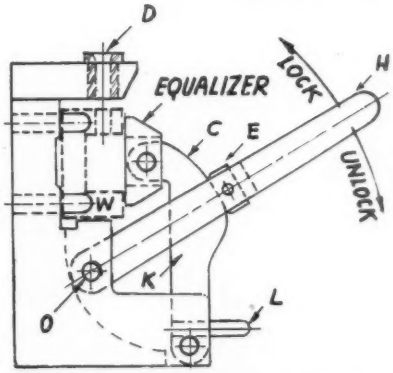


Fig. 145 — A toggle-lever cam clamp jig of similar design and operation to the one shown in Fig. 143, but designed for holding work in a vertical position.

hand, and also clamps the piece firmly in the jig so that it cannot revolve or wobble and break the drill.

Commercial Toggle Lever Clamps

Figure 147 shows an aircraft toggle clamp of the double-action type holding a cast iron part in a jig for drilling two holes. The double-action function controls the U-shaped clamping bar, giving it a slower action than the movement of the handle. The result is that a far greater pressure is applied on the work piece to hold it firmly while drilling. All parts are cyanide hardened except the

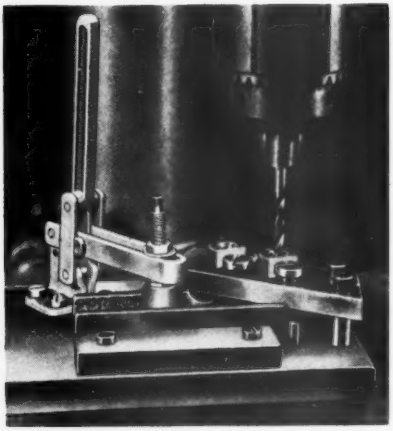


Fig. 147 — A Knu-Vise toggle-lever clamp that employs a double action feature. (Courtesy Knu-Vise, Inc., Detroit.)

toggle bar and handle. Attention is directed to the long U-shaped clamping bar in which the slot permits easy adjustment of the pressure pad to a position that suits the work.

A commercial cam-action clamp is attached to a jig body in Fig. 148. Here a cast iron work piece is held firmly in a jig by moving the handle forward while an attached runner slides along and locks over a spiral cam lobe on the clamping bar. The work registers against suitable stops in the jig and over a tongue which engages a milled slot in the piece. Two holes are drilled through bushings in one strike, by using a special gear-driven double spindle head.

Cam-action clamps are particularly useful for holding work during operations on drilling and milling machines and in arc-welding and spot-welding fixtures because such parts as grey iron and malleable castings, drop forgings and similar components vary in thickness. The links in this clamping unit are cyanide hardened and equipped with

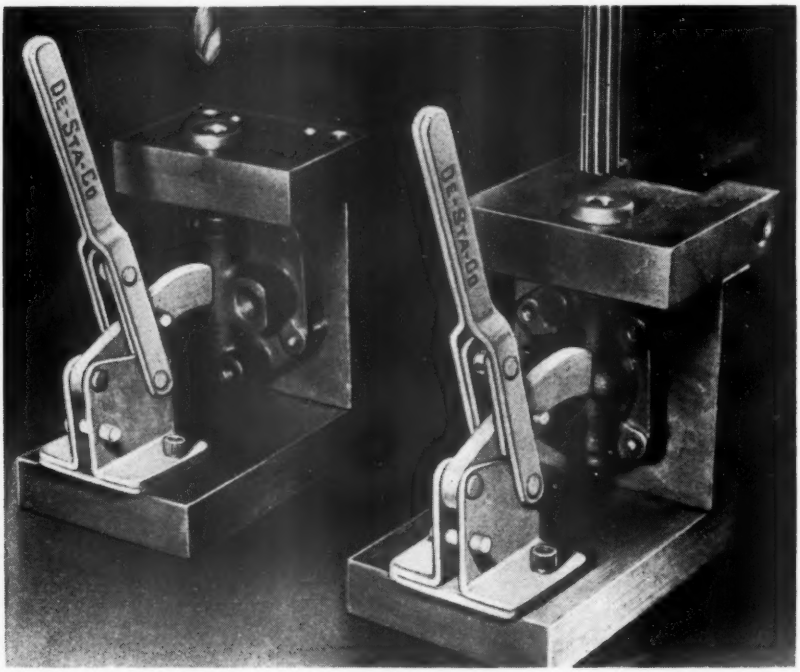


Fig. 149 — Toggle clamps applied on angular stand jigs for drilling and reaming castings. (Courtesy Detroit Stamping Company)

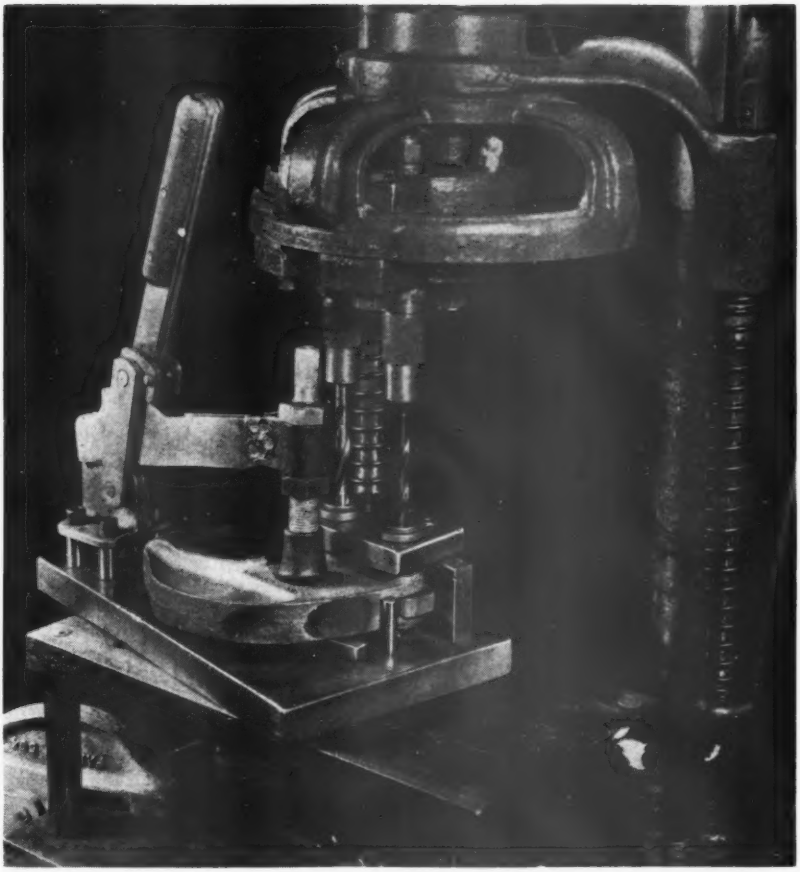


Fig. 148 — Cam-action Knu-Vise clamp in a locked position and holding a piece of work in a jig for drilling two holes simultaneously. (Courtesy Knu-Vise, Inc., Detroit.)

hardened steel liner bushings and replaceable hinge pins. This clamp is frequently used for holding certain parts in aircraft assemblies while drilling, riveting, or welding them together.

Figure 149 shows a two-station job in which a casting is drilled in the first station at the left, and after removing and placing it in the station at the right the drilled hole is precision reamed. The flat surfaces on the work pieces are milled and four holes, drilled in a previous operation, are used to locate the pieces over pins in the two angular-stand jigs.

Even though this work is a casting, toggle clamps can be used for holding the pieces because the milled flat was gaged from the front surface of the pieces seen in the photograph, and the clamping thicknesses are therefore close to size. One "throw" of the handle forward clamps the work and one throw backward unlocks the pieces for removing them from the jig. As observed before, the work rests on pins inserted in the jig bodies. This feature clears burrs and chips, makes it easy to clean

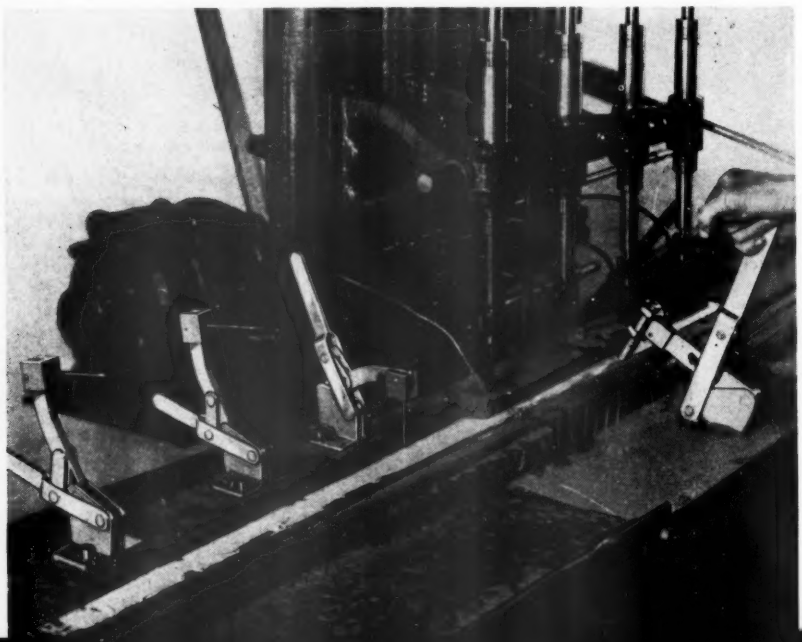
the jigs, and maintains free gaging surfaces.

Toggle clamps are also used in horizontal positions as in Fig. 150. This jig takes the work—which is the steel ring shown—on a stud located under the bushing plate, and the toggle clamp thrusts the ring flat against the jig body while two small holes are drilled. There are many similar applications for these clamps in drilling, milling, and welding operations.

For drilling holes in a steel strip having notched edges, four toggle clamps are employed in Fig. 151. The drill jig is of the overhanging plate type in which the plate carries four bushings. Lubricant is delivered through a small pipe shown near each bushing. One toggle clamp in front of the jig operates at an angle and forces the strip back against the stops under the bushing plate. The three clamps at the left are for indexing the positions of the drilled holes. The ends of these clamping bars each have a finger stop which is brought down by moving the handle, to where the finger may be engaged in the desired notch in the edge of the strip, thus locating the work prior to drilling. The gaging fingers are accurately positioned by entering holes in the base of the jig.

Fig. 150 — Using a toggle clamp horizontally for holding work in a drill jig. (Courtesy Detroit Stamping Company.)

Fig. 151 — Using toggle clamps for clamping and gaging notched strips in different locations for drilling. (Courtesy Detroit Stamping Company.)



INDUSTRIAL PLASTICS

PROCEDURES IN PLASTICS

by Warren V. Prince

EDITORIAL FOREWORD: We feel that securing the talents of Mr. Prince for our readers represents a definite milepost in T&DJ technical service and progress, and that it evidences our determination to lead in the presentation of authentic and stimulating editorial material. The intent and scope of Procedures in Plastics *is clearly defined by the introduction to Mr. Prince's first article. To further demonstrate that this series may well be considered "required reading" for any production executive, engineer or tool designer engaging in the plastics field a brief summary of Mr. Prince's background and activities is in order.*

Mr. Prince is Plastics Engineer and co-organizer of the development engineering department at the Weatherhead Company of Cleveland, manufacturers of aircraft, automotive and refrigeration equipment. He has converted many of the company's products over to plastics and his work on plastics production problems has involved working with the foremost plastics molders in the country. He has worked with plastics materials producers at their plants on special development problems. His current responsibilities in plastics cover: selection of proper material per application, design of plastics parts, mold design and supervision of mold making, sample parts molding, establishing best production methods and testing of the finished product.

Mr. Prince has worked with plastics since 1935 when he did his first designing of parts and molds at The Hoover Vacuum Cleaner Company. Four and a half years were spent on Hoover product design and patent development.

Paralleling mechanical engineering activity in tool design and production methods development for Thompson Products, Inc., and work on electrical, gear-driven units for large guns and light equipment for aircraft with The Acrotorque Company, Mr. Prince also functioned in a consulting capacity on the design of plastics parts and molds.

In the teaching field Mr. Prince has conducted classes in plastics sponsored by Fenn College and was the first instructor in plastics at Cleveland Plastics, Inc. Currently, he is training advanced workers in plastics at The Weatherhead Company in addition to his plastics engineering duties there, and is also conducting evening classes in "Plastics for Industrial Use" at Cleveland's John Huntington Polytechnic Institute.

Mr. Prince is a member of the Society of The Plastics Industry, Society of Plastics Engineers (and vice-president of the Cleveland chapter), American Society for Testing Materials, Society of Automotive Engineers and the American Society for Metals.

E.W.P., Tech. Ed.

PROCEDURES IN PLASTICS

Introduction

TO initiate an adequate presentation of any phase of such a complex subject as is today implied by the word PLASTICS necessitates that the introductory material be of a rather elementary nature. At the same time it should assume the form of an outline in order to disclose the forthcoming coverage of the subject.

There are many advanced technicians, skilled tool designers, and product and methods engineers who are finding their thinking and planning channeled more and more into the plastics field, men who have not had specific training in the plastics applications that they now find themselves called upon to investigate. For them, the more elementary portion of the text is essential. By those who have, to a greater or less extent, worked with plastics, a review of the elements of the subject presented in the light of today's materials, developments and techniques, should be most welcome as a "refresher course."

The art of plastics has become of age. The industry has overcome its growing pains and has matured enough to recognize and benefit by early mis-steps in the form of applications destined for market without benefit of sufficient consideration of the production problems and the use to which articles of plastics manufacture were to be subjected. In the future, plastics will have a tremendous impact upon the manufacturing industries and upon our daily lives if applied and carried through intelligently. That same intelligent approach dictates that a modicum of "de-glamourizing" be injected into the current study and contemplated use of plastics.

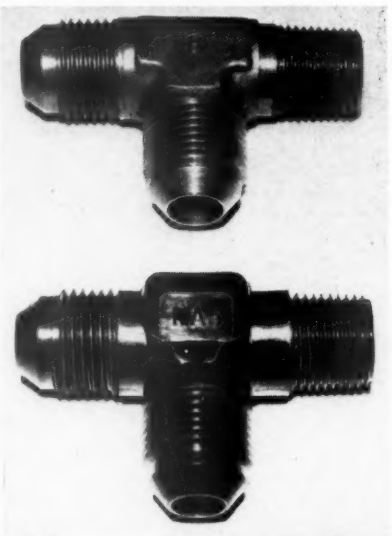
Therefore, these chapters may be considered a course, in outline form, on the fundamentals of procedures in plastics and they will explore the advantages and disadvantages of each phase of the subject. Only by being given the contributing reasons behind every important statement of fact, can the reader develop the tools with which to think for himself as problems arise. Once the student, be he product designer, mold maker or fabricator, masters the "why" and "when" of plastics, the way is paved for him to develop and acquire more rapidly his own "know how."

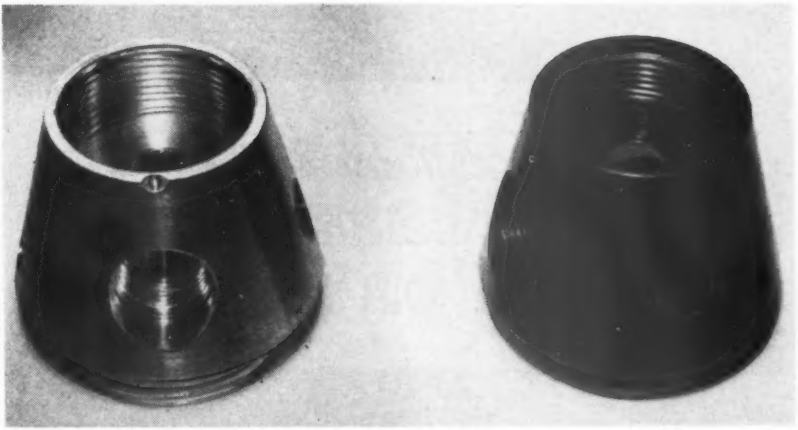
Advantages and Disadvantages

One of the most common mistakes in the plastics industry today is that of improper selection of a plastics material for a given application. Materials should be selected according to: (1) the use to which they are to be put; (2) the method by which they are to be molded

Tube and pipe fittings. Upper, fabricated in metal. Initial forging operations are followed by screw machine drilling, chamfering and threading.

Lower, a phenolic molded plastic which comes from the mold finished as shown. Holes are cored and the chamfers and threads embodied in the mold.





M-52 Fuse. Left, all metal construction. Originally of bar stock to which are applied the subsequent operations of turning, boring, facing, threading and cut-off. Right, as a phenolic plastic finished completely in the molding operation.

or fabricated; and (3), the cost and availability.

There are about twenty principal types of plastics available. Each of these types, in turn, is broken down into different formulations which result in a great variety of physical properties. In all, there are virtually thousands of various plastics materials which can be purchased on the market as stock items. Consequently, it becomes unnecessary for the average molder or user of plastics to attempt to master the chemistry and manufacture of the materials. The manufacture of materials involves special equipment and techniques. All that he need know is the chemical name of each of the twenty principal types, their fundamental differences, and to have access to good physical properties charts of the available materials. Familiarization with the twenty main types and the differences between them is, in part, the objective of this course of study. Physical properties charts can be obtained from several sources, such as the "Plastics Catalogue"[1], "P.M.M.A. Technical Data Book"[2], "A Ready Reference for Plastics"[3], and from the respective materials producers.

Following is a list of some of the advantages and disadvantages of plastics compared to other materials:

Advantages of Plastics:

1. Light weight
2. Low cost
3. Odd and special shapes are possible and at lower cost
4. Faster production
5. No surface finish or coating is necessary
6. Wide color range
7. Molded in one piece instead of assembled
8. Fewer man-hours in production
9. Non-conductor of electricity
10. Very low heat conductivity
11. Inserts can be molded in plastics
12. Good chemical resistance
13. Quiet in operation; i.e., gears, racks, cams, etc.
14. Good optical effects (refraction and diffusion of light)
15. Transparency without brittleness
16. Good impact strength
17. More pieces per pound of material in molding
18. Good power factor
19. Better wear resistance in some cases
20. Pieces come from mold practically finished
21. Saving in material required per piece.
22. Little or no moisture absorption

[1]Plastics Catalogue Corporation, 122 E. 42nd St., New York, N Y., $6.00; [2]Plastics Materials Manufacturer's Association, Tower Bldg., Washington, D.C., $1.50; [3]Boonton Molding Company, Boonton, N. J., 75¢.

FINE
PULL TO DROP TAKE-OFF GEAR
THIS INTERLOCK MUST BE OPERATED BEFORE THE HEAD CAN BE STARTED FORWARD
HIGH VOLTAGE CONNECTION
3 2 1 0 1 2 3
LOCATION AND LENGTH OF WHEEL TRAVERSE
BRAKE
POSITION #1 — OFF
POSITION #2 — ON
PUMP SPEED 700 S.S.F.
GOVERNOR SET AT 70 S.S.F.
GOVERNOR SPEED WHEN TESTING SPEED LIMITING GOVERNOR. FUEL OIL VISCOSITY MUST NOT EXCEED 70 S.S.F.

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LASTING • LEGIBLE • ATTRACTIVE • INEXPENSIVE

Disadvantages of Plastics:

1. Low physical strength
2. Warpage
3. Soften with heat
4. Brittle when cold
5. Inflammable
6. Brittle at all times
7. Absorb water
8. Crack with age
9. Cold flow properties
10. Subject to scratching and abrasion
11. Discoloration
12. Low heat resistance
13. High thermal expansion
14. Costly molds and slow production cycles
15. Affected by certain solvents and chemicals.

One must bear in mind that each statement or characteristic in this list applies only to specific plastics and not necessarily to all plastics. Reference to the physical properties charts will provide the answer to most questions pertaining to any material under consideration.

To briefly define these advantages and disadvantages as itemized:

Plastics vary in weight from that of an equal volume of water to about twice the weight of water. One cubic inch of plastic will weigh between .036 lb. and .072 lb. Following is a comparison with other materials:

Plastics	= .05 lb. per cubic inch (average)
Steel	= .28 lb. per cubic inch
Oak	= .26 lb. per cubic inch
Pine	= .16 lb. per cubic inch
Glass	= .09 lb. per cubic inch
Aluminum	= .09 lb. per cubic inch
Magnesium	= .06 lb. per cubic inch

For most finished parts of complex shapes, plastics can be employed at a much lower unit cost providing their other properties permit.

Odd and intricate shapes that may be entirely impractical to produce by cutting tools can be quickly molded of plastics. Hence, faster production is obtained, especially when multiple-cavity molds are used.

Parts come from the mold having the desired color and a high gloss finish. The surface of a plastics part reproduces the mold surface quality faithfully. The material itself usually has sufficient chemical and oxidation resistance to require no protective coating.

All except a few of the plastics offer a very wide color range. Materials come from the manufacturer with dyes or pigments as ingredients and thus can meet almost any color specifications.

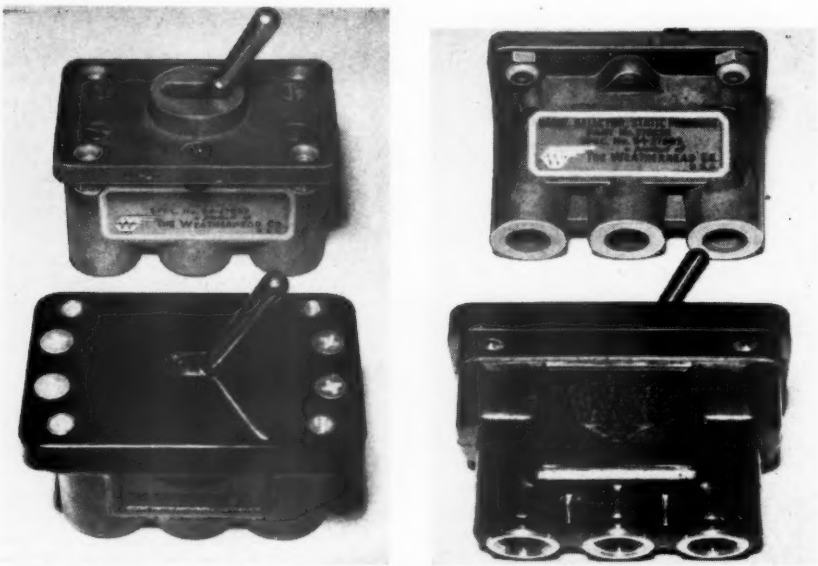
Many products previously made of a number of small parts in metal, and assembled by riveting or other means, can be redesigned and molded as a single unit plastics part.

The saving in man-hours is an important advantage of plastics. This saving may be the result of several of the other advantages mentioned. In manufacture from materials other than plastics, time is consumed by such operations as the cutting away of material in making a part, the finishing and assembly of such parts, etc. Where all this can be replaced by the molding of one piece, the man-hours saved may well be worth the change, assuming other things equal. Furthermore, many parts can frequently be molded at a time by one operator using a multiple-cavity mold and the same man can operate two or three presses, depending on the nature of the molds and the length of time required for the molding cycle.

Plastics materials are very good dielectrics and are non-conductors of electricity. Hence, they may be used in electrical applications without requiring additional insulation. Some common plastics rate as high as 700 volts per thousandth of an inch for ⅛" thickness before electrical breakdown.

Plastics materials in general are extremely poor conductors of heat. Consequently, they are used as handles for cooking utensils, plugs for electric irons, etc. Obviously, the more heat resistant materials must be selected for such applications.

Inserts, most of which are of metal, can readily be incorporated in plastics parts during the molding operation. The inserts are positioned in the mold in their proper locations and the material flows around the inserts as the mold cavity becomes filled. As the material hardens in the mold the inserts become a permanent and integral part of the molded piece. Studs, contacts, threaded parts of metal, etc., can be molded in as inserts. Plastics materials generally have no chemical effect on inserts.



Selector Valve. Upper views show metal model. Lower views are of same valve as a plastics product. Note pipe thread inserts molded-in. Inserts for cover hold-down screws represent simplification of holding means. The nameplate is applied to the metal model by an additional operation as compared to being imparted to the plastics model from the surface of the mold.

Most plastics have effective chemical resistance to the commonly encountered chemicals such as salts, mild alkalies and acids, common food juices, etc., and to oxidation.

Laminated plastics and the like, when shaped into such components as gears, run very quietly as compared to metal gears and are widely used for that purpose. As far as the tooth strength is concerned it is equivalent to that of a cast iron gear of the same dimensions.

Transparent plastics have high refractive indexes, some being higher than that of glass. Consequently, plastics are used as lenses, prisms and other optical devices. One plastics material is even more transparent than glass.

Some materials are used for their translucent properties, which make them valuable for such articles as lamp shades, illuminating fixture bowls, light globes, and signal lenses. They are so used for their diffusion properties, low cost and resistance to breakage.

Inserts in machine housings and windows for aircraft, which must withstand shock from gun fire, are common applications for those transparent plastics which are relatively unbreakable.

Thin objects molded of thermoplastic materials of good impact strength can be dropped or hammered without breaking. The novelty stores are full of such applications.

Since plastics materials are many times lighter than metal, many times more pieces can be produced per pound of material. For example, if a plastic part weighs half as much as a die cast aluminum part, twice as many plastic parts per pound of material can be obtained.

Nearly all plastics have a very good power factor as compared with other materials. By that is meant that these materials do not affect electrical circuits, such as in radios, from the standpoint of power loss.

When some molded materials are combined in assembly with metal parts and used in the presence of water or lubricants, they actually outwear the metal members.

When a piece is molded, it usually comes from the mold practically finished, with little left to do but break off the thin film of "flash" or perhaps remove a feed channel.

Machined pieces of metal or other materials usually must be tooled from bar stock, forgings, or castings, and much metal is removed and scrapped in the process. However, a plastics part has no such waste. Its only waste is in the "flash" or feed channel which is very small in proportion.

Some plastics are very good in water and moisture resistance. Oils and other liquids are similarly repelled. Fabrics and clothing can be made water resistant by impregnating them with certain plastics resins.

From the standpoint of disadvantages, perhaps the greatest is that of low physical strength, in general, as compared with metal. This is of primary consideration, especially in the industrial market. In comparison with materials other than metal, however, it is usually superior. The low physical properties are those such as flexural strength, tensile strength, shear, torsion, compression strength and, in some cases, impact strength.

Most of the thermoplastic materials begin to soften with heat at temperatures of from 130° F to 180° F. The thermosetting materials, on the other hand, never soften with heat and have safe operating temperatures of from 350° F to 500° F. Upon further heating they char.

Many thermoplastic materials become brittle when cold and lose the impact strength possessed at room temperatures. Temperatures of 70° below zero F, experienced in aircraft installations, cause many to become as brittle as glass and extremely hard and rigid.

Some plastics are inflammable. Some will burn only when in contact with a flame but extinguish upon removal. Most plastics can be made non-inflammable by specifying that appropriate plasticizers (chemicals to control physical properties) be mixed in the material. Thermosetting materials char, rather than burn, from excessive heat.

Thermosetting materials are brittle at all times except when certain fillers are used to increase impact resistance.

Many plastics absorb a small percentage of water which usually results in warpage or poor electrical qualities.

Some crack with age as a result of ultimate evaporation of the plasticizers or because of non-uniform curing.

Thermoplastic materials in general have cold flow properties. By this is meant that when a material is distorted by a force beyond its elastic limit, it flows slowly over a period of time to relieve the stresses and permanently assumes a new and distorted shape.

Most plastics are softer than metals. Consequently, they are easily scratched and are subject to abrasion. One, however, exhibits the opposite effect and tends to polish with age by continued handling. Thermosetting materials have the best permanency of surface finish.

Plastics, as well as other materials, can discolor with age and are affected by sunlight as a result of not containing permanent dyes or pigments.

As compared to metals in particular, most plastics have poor heat resistance. However, some can easily withstand a temperature of 500° F continuously in service.

Changes in temperature, on the other hand, cause a high rate of thermal expansion and contraction. This rate is recorded as the coefficient of expansion and it ranges from twice to ten times that of steel.

Molds are the most costly part of plastics production and the quantities of molded parts must run high in order to result in a justifiable unit mold cost per piece. Production cycle time has a definite bearing on cost and cycle time depends largely on the type and complexity nature of the molds.

Many plastics, especially certain thermoplastic materials, are easily affected by various chemicals and solvents. They can soften, warp, swell, crack, or lose their surface finish.

In conclusion, it should be apparent why so many plastic applications have failed in service, all due to a lack of full appreciation of the factors outlined. On the other hand, there are countless potential applications for plastics yet untouched due to the same lack of appreciation of their inherent advantages. We will next analyze and interpret in greater detail the points so far outlined.

JET MOLDING

Conversion Unit Speeds Output And Improves Quality

JET molding has now been in commercial use on war production for nearly three years in several molding plants, and this process for the injection molding of thermosetting (as well as thermoplastic) materials is creating a very considerable interest in the plastics industry.

Jet molding is several times faster than compression molding of thermosetting plastics, which means that much smaller and less expensive molds can be used for a given production requirement. For example, on one very well known war job, 12 mold cavities on the jet process are turning out slightly higher production than 64 cavities by the older method.

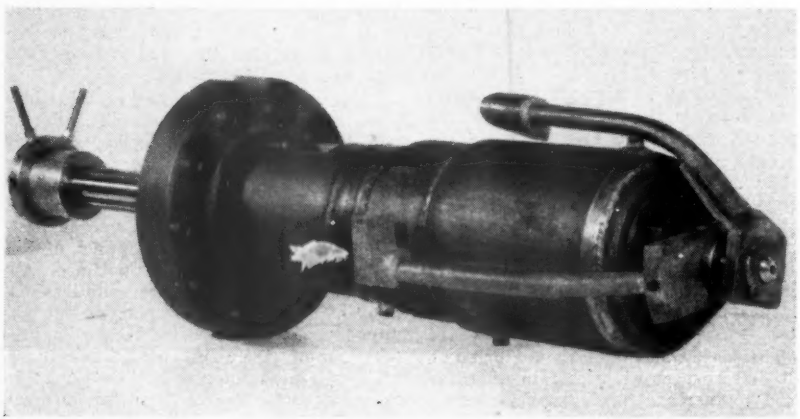
In another case, an aircraft item containing several metal inserts was produced by compression molding at a production rate of 5 cycles per hour. The low production rate was caused by the combination of a thick molded section which required a long cure, and time lost in loading several metal inserts into each mold cavity. When the job was changed to jet molding, it was possible to simplify the insert problem and the production stepped up to 42 cycles per hour.

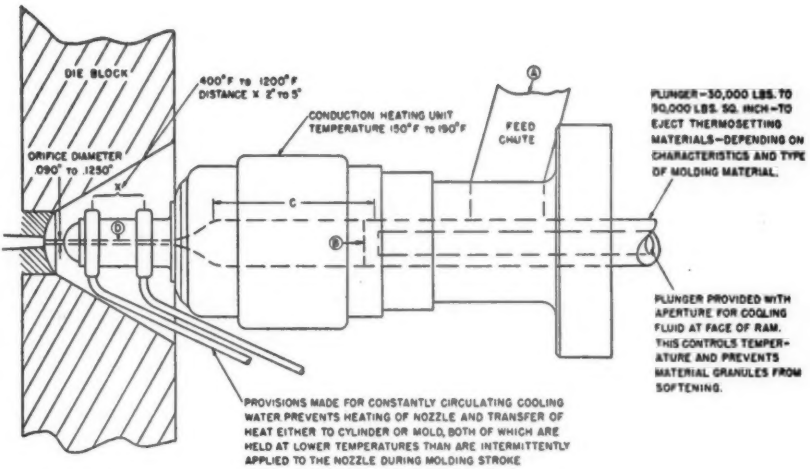
In addition to high speed production and the resulting savings in mold costs, the quality of the molded product is very much improved because all of the plastic material is cured uniformly throughout the section of the part, regardless of its thickness. This is brought about by the fact that all of the heat load required for curing the thermosetting material is applied uniformly to the material before it reaches the mold. The result is a general improvement in physical properties and closer dimensional tolerances.

Many of the molded parts used as components of equipment for the Armed Services must be held to very close dimensional tolerances, much closer than is usually maintained on commercial molded goods produced by compression molding. Because of these close tolerances it has been impossible to maintain production rates on compression molded parts; the percentage of rejected parts sometimes running well over 30 percent.

One such molding job, which was expected to turn out 4000 parts per week

Jet injection unit, comprising specially designed cylinder assembly and nozzle, can be added to any standard injection machine. Developed and licensed by Plastics Processes, Inc., Cleveland, Ohio.




DIE BLOCK
400°F to 1200°F
DISTANCE X 2" to 5"
CONDUCTION HEATING UNIT
TEMPERATURE 150°F to 190°F
FEED CHUTE
PLUNGER—30,000 LBS. TO 90,000 LBS. SQ. INCH—TO EJECT THERMOSETTING MATERIALS—DEPENDING ON CHARACTERISTICS AND TYPE OF MOLDING MATERIAL.
ORIFICE DIAMETER .090" to .1250"
X
C
PLUNGER PROVIDED WITH APERTURE FOR COOLING FLUID AT FACE OF RAM. THIS CONTROLS TEMPERATURE AND PREVENTS MATERIAL GRANULES FROM SOFTENING.
PROVISIONS MADE FOR CONSTANTLY CIRCULATING COOLING WATER PREVENTS HEATING OF NOZZLE AND TRANSFER OF HEAT EITHER TO CYLINDER OR MOLD, BOTH OF WHICH ARE HELD AT LOWER TEMPERATURES THAN ARE INTERMITTENTLY APPLIED TO THE NOZZLE DURING MOLDING STROKE

JET MOLDING NOZZLE PRINCIPLE

by compression, actually yielded only an average of 1100 per week, because of the very high percentage of scrap. When this job was shifted to jet molding, the same number of mold cavities turned out 18,000 pieces per week.

Any of the commercial thermosetting molding materials can be used, such as phenolics (including fabric fillers), ureas, melomines and natural rubbers. A high percentage of the present production is on the fabric filled, high impact, type phenolics. It is, of course, not necessary to weigh or measure the mold charges, since the mold cavities are filled from a storage cylinder.

Thermoplastic materials, including the synthetic rubbers and rubber-like compounds, can also be handled by the jet method with certain advantages over conventional injection. In the standard injection machines, all of the heat, required for softening and plasticizing the material, is applied in the heating cylinder. The high temperature required is frequently deleterious to the material in storage in the cylinder, causing burning or some disintegration of the stock. This possible trouble is eliminated in the jet method by the fact that the temperature in the heating cylinder is kept well below any danger point. The high heat is applied at the nozzle only to that amount of material required to fill the mold, and only for a very short duration. This is particularly advantageous in the molding of some of the newer types of thermoplastics which are extremely sensitive to high temperatures.

Also, in handling thermoplastics, the cooling feature of the jet provides a "self-valve" preventing the drooling of the material from the nozzle between injection cycles.

Any of the standard injection machines can be converted to jet molding by the addition of a specially designed cylinder assembly and nozzle. The capacity per mold shot is limited for the duration of the war to the sizes of injection machines that are available. However, it is a foregone conclusion that larger capacity injection molding machines will be available after the war.

The molds for the jet process follow the conventional designs which have been used for thermoplastic injection in the past, except that perhaps somewhat greater precision is required. Molds for thermosetting work must be heated in order to prevent loss of heat which has been applied previously to the material. This can be accomplished by electrical cartridge heaters, steam or other means.

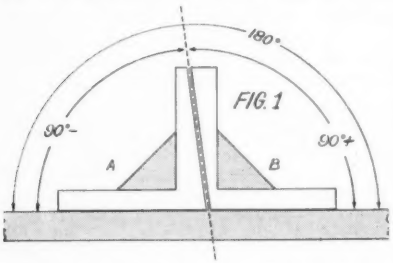
Precision Workmanship, Methods and Tools

ACCURACY AND THE GEOMETRY OF PRECISION

Part III*

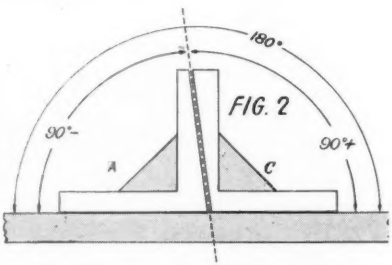
E. Willard Pennington
TECHNICAL EDITOR

HAVING shown Whitworth's method of making or originating true flat surfaces and straight edges, we should next turn our attention to important combinations of flat surfaces or straight edges, i. e., angles. It seems most logical and mechanically consistent to first consider the 90° angle or "square". A master reference square is a highly essential shop and inspection tool, directly so in proportion to its accuracy. The ultimate in accuracy is only attainable when a square is "self-proving"; consequently such a square must be one of three that are mutually and interchangeably and demonstrably equal.



The method of making such master squares involves scraping and was also originated by Whitworth. The procedure is identical to that of "generating" true flat surfaces with one notable exception. Whereas, in making true flat surfaces, the end result (perfect and "self-proving" flat surfaces) is attained without dependence on, or reference to, work previously done, in the case of making true squares, we must have a perfect flat surface or straight edge as a reference.

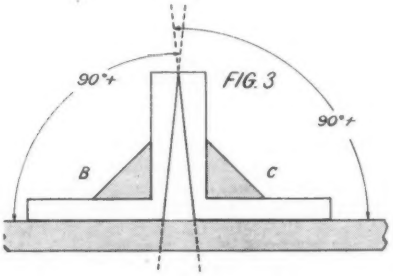
With such a reference plane on which to check the squares we can proceed with two squares, A and B, Fig. 1, and scrape their bases to intimate contact with the surface plate, and scrape their faces to intimate contact one with the other, dividing the scraping as nearly equally between the two as possible. This establishes truly plane or straight bases for the squares and also that the *sum* of their two angles is equal to 180°. There is no assurance however that each is equal to 90°, for one might be 89° and the other 91° also totalling 180°. Therefore, square B is set aside and square C is substituted and scraped to agreement with A, Fig. 2. Note that metal is removed or scraped only from C so that after C is brought fully into agreement with A (as was B), C and B are both equal but *opposite*, as is indicated in Fig. 3.



The next step is that of scraping C and B into agreement by removing metal as nearly uniformly from each as is possible. When this agreement is obtained we know that the sum of their

*Part I, *The Tool & Die Journal*, November 1943, page 90. Part II, *The Tool & Die Journal*, January 1944, page 92.

angles is 180° and, although they may not each equal 90°, that because we "scraped the error" equally from each,



they are both closer to 90° than is A.

Therefore, the next step is that of setting C aside and reducing the error in A by scraping A (and taking care to remove metal only from A) into agreement with B with the result that the sum of their two angles is equal to 180°. This also results in A and C both being equal but *opposite*, as were C and B in Fig. 3, and of lesser error.

A and C are next scraped into agreement by the equal removal of metal from each, and when agreement is attained, their two angles add up to 180° and each is closer to 90° than B. This rotational sequence of operations is followed, alternately scraping metal from two squares and next removing metal from only one, until all three squares are in mutual and perfect agreement, or fully interchangeable, i. e., when any two of the three squares register perfect agreement two things that are equal to the same thing are equal to each other. Therefore, the three squares, by the very nature of the self-proving process by which they were made or generated, are known to be correct. The method can be called that of generating to proof. If more detailed instructions should be needed to carry out this process, the chart of the sequence of scraping operations for generating master surface plates and/or master straight edges that appeared in Part II (Tool & Die Journal, January, 1944, Page 101) can be applied to the making of master squares. All that is necessary is to substitute squares A, B and C for plates No. 1, No. 2 and No. 3 and then follow the sequence of operations according to the diagram.

There is another method for originating squares that is highly interesting because of its geometry and particularly because it involves an inside square, i. e., an internal 90° angle. Fig. 4 shows such a square, S, and a rectangular metal template, T. By filing or scraping the template edges, angle A of the template is fitted to the internal angle of the square. Next, and in the same manner, angles B and C of the template are brought to agreement with the square. Then, where the remaining angle D of the template is applied to the square, the error of the square shows up at E magnified or multiplied four times, i. e., three times by the template angles A, B and C, and once by the inherent error of the square. This discloses both the magnitude and the direction of the error in the square. The square should next be corrected as closely as possible and then the template angles A, B and C (and edges) again brought into agreement. The error then prevailing at E should be of lesser magnitude but still in the same direction

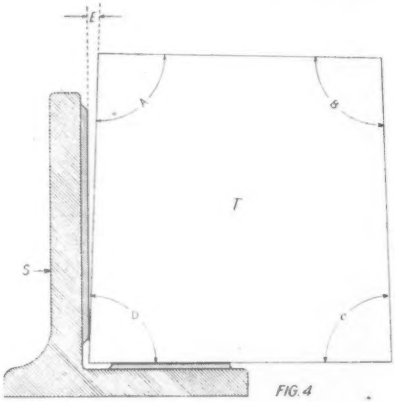


FIG. 4

unless the square was "over-corrected". This sequence of operations is followed until the error at E has vanished at which time both the square and the template are correct. Once this has been attained, the square can be used as a working square and the template treated as a master reference and for making additional shop squares.

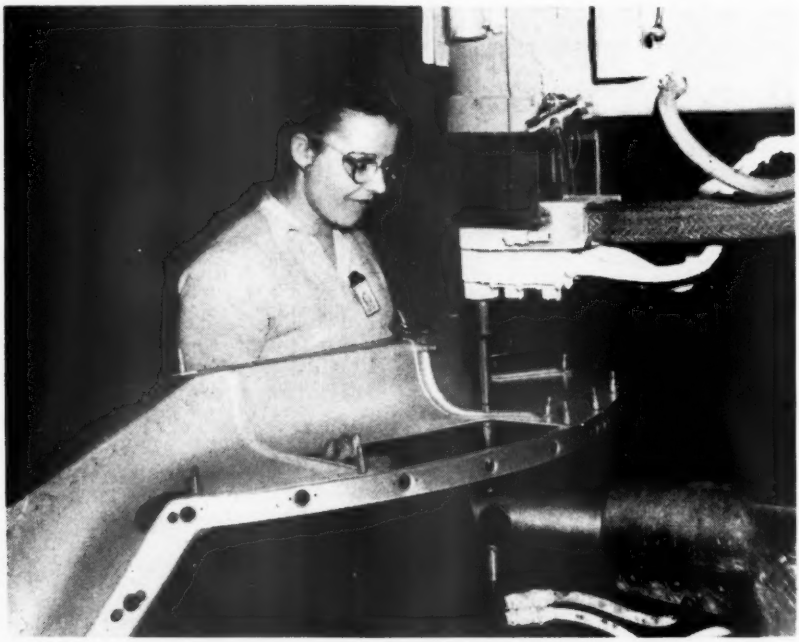
Refrigerated Electrodes in Aircraft Welding

FACED with the necessity of joining together more individual pieces per pound of finished product than any other manufacturer of transportation equipment, the aircraft industry is apparently finding the answer to many of its aluminum spot welding headaches in the new "Frostpoint" type of refrigerated electrode, a survey of leading aircraft and aircraft subassembly producers reveals.

Improved quality of welds, stepped-up output, and a definite increase in the number of welds obtained between electrode dressings are some of the results reported by the various aircraft plants coupled with ease of maintaining good coolant temperatures and the successful application of refrigerated welding electrodes to a fairly wide range of thicknesses of aluminum and aluminum alloys. Refrigeration of the standard type electrodes is claimed to give the same general advantages in spot welding aluminum and aluminum alloys, but to a lesser degree than has been experienced with the Frostpoints.

The Frostpoint electrode, Fig. 1, manufactured by Frostrode Products, 19003 John R St., Detroit 3, is so designed that its coolant tube concentrates all cooling effect in the electrode proper, thus eliminating losses caused by trying to refrigerate holders and welder arms. Each electrode is a permanent installation and is tipped with a quickly replaceable "Frostcap." This cap is cold forged from electrolytic copper for higher conductivity and is internally finned to produce maximum cooling area. The structure of the cap does away with much of the metal separating the working face from

Spot welding of aircraft sub-assemblies at Eastern Aircraft by Frostrode process.



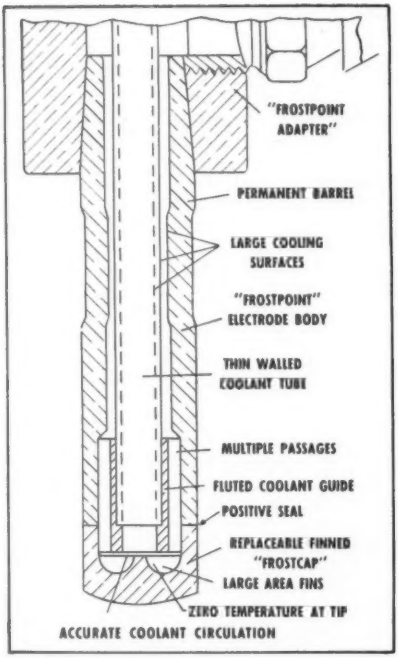
the coolant, thereby bringing the coolant closer to the source of the heat than the conventional type of refrigerated electrode does. Thus, the face of the Frostpoint electrode is effectively cooled right where the cooling effect is most needed. When one Frostcap is consumed, another one is easily slipped onto the permanent electrode. As the life of one Frostcap has been found to be approximately equal to that of the conventional electrode, this feature cuts replacement costs to a small fraction and conserves 90 percent of the copper used in the electrode.

Pickup and Tip Dressing

Provided that all other welding conditions are equal, production checkups show that proper electrode cooling plays a large part in the frequency with which electrodes must be cleaned and dressed. At Chance-Vought Aircraft, for example, ordinary refrigeration has made possible 20% to 30% more spots per cleaning. One Ohio aircraft company found that the increase of spots possible between dressings ranged from between 100% to 150% when employing the conventional type of electrode with refrigeration.

When welding sheets or small parts of thin, non-ferrous alloys, the Murray Corporation has learned that refrigerating conventional electrodes has increased machine output to as high as a 3 to 1 ratio, or from 50 to 150 spots between dressings. On .091" stock, refrigeration doubled the number of welds. Southern Aircraft Corporation estimates that the use of refrigerated conventional electrodes allows them to make as high as 4 times as many welds between the tip dressings as was possible before. Curtiss-Wright also reports more welds per dressing for sub-freezing as against 40° F coolant temperatures.

Changing from the common refrigerated electrodes to Frostpoints has enabled a former stove manufacturer, now engaged in aircraft work, to further step up the number of good welds on .051" material between dressings by from 200% to 300%. The same coolant temperature was used in both cases. At Southern Aircraft Corporation, Chance-Vought Aircraft and Republic Aviation Corporation, where Frostpoints have recently been installed in place of the standard refrigerated electrodes, preliminary tests



Section thru Frostpoint electrode showing replaceable finned cap and coolant circulation system.

indicate still further decreases in the need for periodic electrode dressing. The amount of gain to be expected apparently differs quite widely among aircraft companies. Republic, for instance, reports preliminary tests as indicating an increase in number of spots between dressings of as much as 10 to 15 times over refrigerated conventional electrodes. Southern Aircraft's experience, on the other hand, indicates a gaining of 50 to 100% for Frostpoints as against refrigerated conventional tips. One large Eastern company has reported that under experimental tests as high as 5000 spots have been obtained between dressings.

Much of the divergence as to frequency of dressing is traceable apparently to other causes. Thus, one company reports that potential gains along this line from refrigeration of electrodes cannot be obtained unless other conditions such as cleanliness of work, proper surface preparations, etc., are carefully watched in production.

Optimum Temperatures

These results with Frostpoints have been obtained on aluminum alloys and alclad sheet varying in thickness from .012" to .125". Production runs with Frostpoint electrodes have produced fairly close agreement among users regarding the most satisfactory coolant temperatures. The experience to date indicates that with Frostpoints an optimum cooling temperature of 0° F is both safe and efficient for most gauges.

Chance-Vought Aircraft keeps the coolant at 10° F; Republic Aviation has found that a range of from −5° F to −10° F works well; Southern Aircraft Corporation goes to from 5° F to 15° F. A Pittsburgh company uses 5° F at present. Other users report variations of like nature. There is some indication that heavier gauge stock requires a somewhat lower coolant temperature than do the lighter materials. The general practice, however, seems to be to use the same general temperature range for both heavy and light gauge stocks. Southern Aircraft, for instance, maintains the 5° F to 15° F range for thicknesses ranging from .025" to .125". Reason for this is that while the gains are not as pronounced on the thinner material, the lower temperature does appear to give better results than would a higher.

Weld Quality and Output

According to the reports covered in this survey, several factors not related to the refrigeration of the electrodes have been observed to affect the quality of the weld spots on aluminum and aluminum alloys. These include slight variations in weld penetration, welding current, tip contour, and surface condition of work. When these and other conditions are equal, however, the evidence from such companies as Southern Aircraft Corporation, Murray Corporation and others is that refrigeration definitely improves weld quality, although not necessarily uniformly for all gauges and operation conditions.

One aircraft manufacturer indicates that spot welding quality improvement is more noticeable on thin gauge stock at low welding rates than it is on heavier thickness where a relatively high production rate in terms of spots per minute must be maintained.

Substituting the Frostpoints for the conventional refrigerated electrodes is claimed to improve the average quality of the spots still further. These results, according to experiences in several companies, are due largely to a reduction in the number of surface burns in proportion to the total number of weld spots made by the operator. This, in turn, is made possible by the quicker and more efficient cooling.

Although actual time saved by decreasing the frequency of electrode cleaning may be only a small part of the working time, numerous companies nevertheless have reported increased overall output. Grumman Aircraft Engineering Corporation, for instance, reports that on the thicker gauges of the softer aluminum alloys, refrigeration definitely steps up output and, in addition, improves the external appearance of the assembly. The Glenn L. Martin Company raised the total number of spots per month by 15% with the use of refrigerated electrodes. Chance-Vought Aircraft likewise found an increased output with refrigeration because of time saved in tip cleaning. Republic Aviation Corp., which detected only a negligible increase when first applying refrigeration to electrode cooling, got a very appreciable increase when the switch to Frostpoints was made. This new type electrode was also responsible for stepping up the number of spots per day at Southern Aircraft, according to the report from this company.

One item of particular interest was noted in the report from the Glenn L. Martin Company. Here refrigerated cooling has been found to be extremely useful on special jobs—that is, on jobs characterized by a geometry necessitating electrode design which incorporates severe restrictions to thermal flow. Here, the super-cooling of the electrode shank produced a cooling effect roughly equivalent to normal water cooling on the welding end of the electrode. This, in turn, made possible such welding on a production basis. Had normal cooling been used in these cases, the temperature on the welding end would have been such that production welding would have been most difficult.

HIGH PRODUCTION BROACHING OF DRIVE SPLINE INSERTS

THE ability of the broaching process to rapidly remove large amounts of stock and at the same time to obtain high production with extreme accuracy is illustrated by the use of this method to cut deep slots in alloy steel drive spline inserts for aircraft hydraulic disc brakes produced by the Aeronautical Division, National Acme Co., Cleveland, Ohio. More than half of the original diameter of $1\frac{3}{16}$" round stock is removed over a length of more than 3" in two passes by a single machine equipped with two broaches.

In making the inserts, it is necessary to maintain the width of the slot within close limits and to locate it directly opposite a narrow groove on the periphery of the piece. The depth of the slot from end-to-end of the piece also must be held to specified dimension. A high production setup is required, since 16 of the inserts are used in each brake assembly.

The setup utilizes a horizontal broaching machine of sufficient capacity to pull the two broaches simultaneously plus a special fixture, designed by the Colonial Broach Co., Detroit, for rigidly holding two pieces in the correct locating positions. The pilots of the broaches assist in the loading operation, as explained later.

The fixture is mounted against the face-plate of the horizontal machine and is hydraulically operated. The broaches are of the sectional type mounted in broach holders which move in individual guide ways bolted to the vertical base

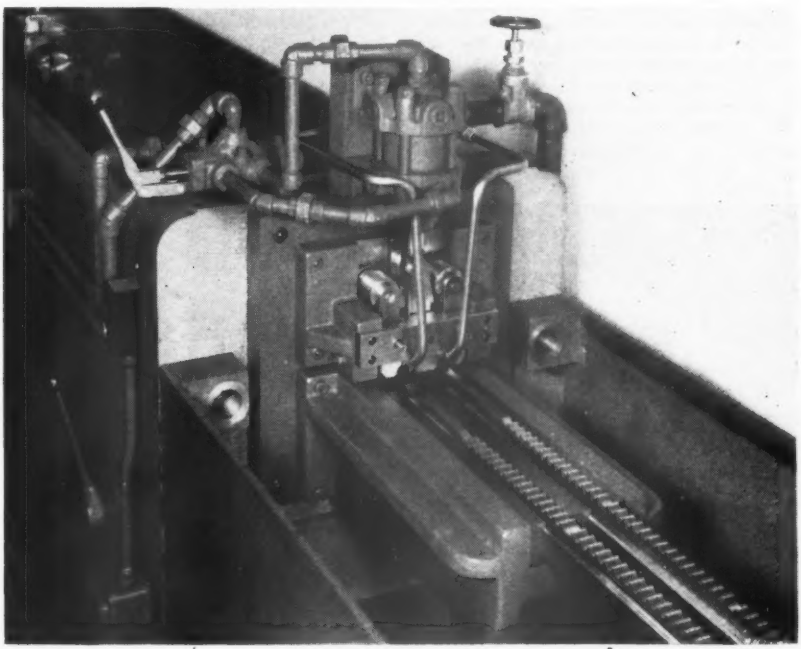


plate of the fixture. Oil under pressure for operation of the fixture is supplied from the same system used for hydraulic operation of the broaching machine.

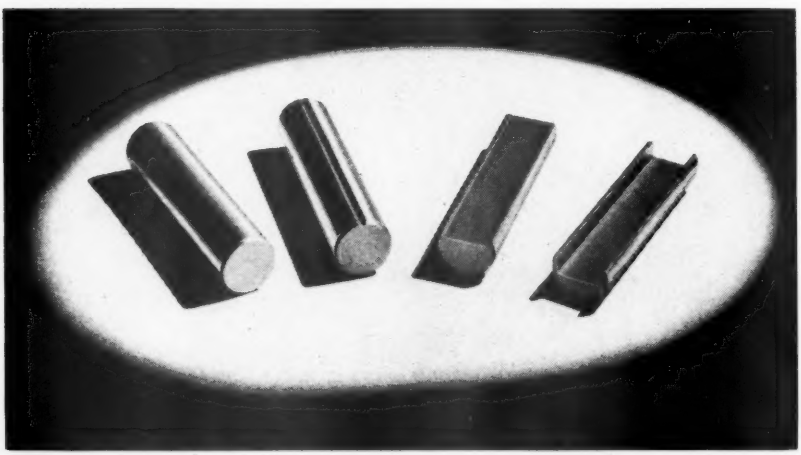
The fixture is of the cam and roller type and clamps two pieces simultaneously (Fig. 1). The center portion of the clamp is stationarily attached to the bar shown across the face of the fixture. This portion serves a double purpose, i. e., to form half of each pair of semi-cylindrical jaws by which the pieces are held in both stations and to locate them. The slot broached in each piece must be exactly opposite a narrow groove with a bottom radius which has been previously broached. That portion of the clamping fixture, therefore, that constitutes the jaws that clamp the piece during the first operation is fitted with a pilot which engages the narrow groove and thus positions the piece so that the groove is directly above the broach.

On either side of the center portion of the clamp are two arms which move against the pieces and hold them tightly in place when the piston of the hydraulic cylinder moves upward. The lower ends of these arms form the remaining halves of the semi-cylindrical jaws in which the parts are clamped while being broached. The parts fit freely in the jaws when the clamps are released, but are rigidly held during the pass of the broach.

For convenience in loading, the pilot end of the first broach (nearest the operator) is channeled so that the locating groove in the piece will "ride" uppermost into the jaws and engage the pilot for final locating before the cut starts. The piece is placed by the operator on the broach pilot so that as the broach moves inward the piece is drawn into the fixture. The fixture clamps are then closed and the broaching pass is completed. Return of the broach pushes the work out of the clamp. The operator then transfers the piece onto the pilot of the second broach, inserting an unfinished part in the first station. In positioning the first piece for the second pass, the shallow slot broached by the first pass "seats" over the pilot of the second broach. Thus, one part is finished with each pass of the two broaches.

Figure 2 shows the parts before and after slotting. At left, the ground bar stock is shown. Next, the part is shown after its locating groove has been broached and prior to the major slotting operations which are illustrated in the two right hand views.

In the first station, the broach produces a flat the length of the piece, removing approximately ¼" of the diameter, at the same time leaving about one thirty-second inch of metal to start forming the sides of the slot. In the second pass, the slot is deepened an additional ¼" (approximately) and the width not only brought to size, but the sides of the slot are highly finished and held within close limits. The top edges of the sides of the slot are also rounded. The production rate is approximately 100 pieces per hour.

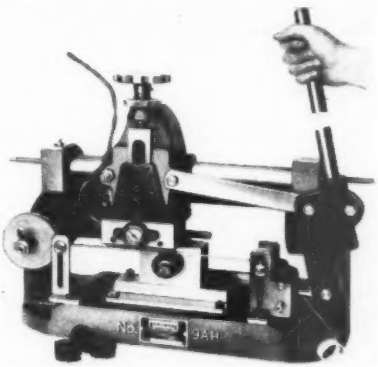


HIGH SPEED MARKING AND FILLING

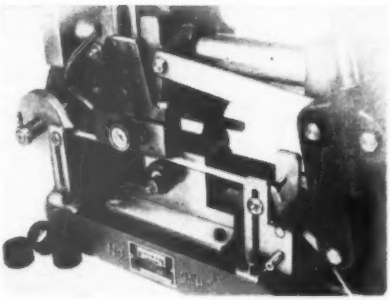
a T. & D. J. Picture Story

The Acromark No. 9A group of marking machines was expressly designed to meet the urgent demand for both speed and precision marking of unhardened steel, brass and other metal and alloy pieces and parts. They are suitable for marking most metal substitutes and synthetic materials. Tubular, cylindrical, flat, angular or strip shaped components can be effectively and efficiently marked as the machines are easily adapted to the particular job.

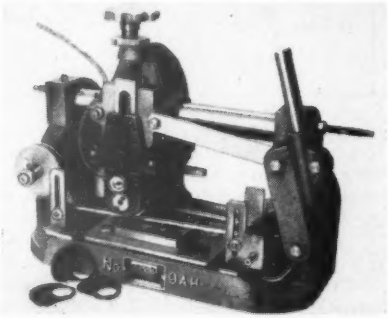
An interesting method of both marking and coloring or filling is embodied in their new 9H machine. A speed of as



much as twenty to one is being experienced by users of the new equipment as compared with former methods of production and filling of the marks with white, silver or other colors. Illustrated here are examples of the machine as arranged for marking graduations and numbers on binocular eyepiece adjustment sleeves and for marking numbers, names and other data on other black or otherwise finished metal parts. The close-up shows in greater detail the operating parts for marking the adjustment sleeves. The third photo shows an interchangeable assembly to accomplish the marking of flat parts for the same binoculars. The flat marking assembly incorporates the use of a roller die that rolls the mark into the flat part held in position by a special form fixture as the die rolls over it. A ratchet feed advances the transfer tape at each stroke of the machine, placing a full transfer filling into each mark. An appropriately engraved steel marking die sinks the marking and the color transfer at the same time. The die is heated by an electrical heating element and on the front of the die holder is a thermometer for heat regulation.



The Acromark Company of Elizabeth 4, New Jersey, "tools" these machines for the marking of innumerable instrument and aircraft parts heretofore marked by slower processes followed by hand filling.



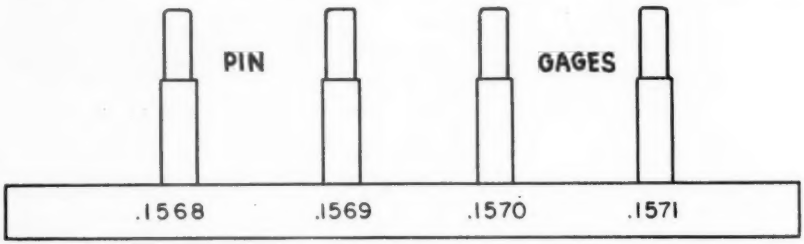
SELECTIVE INSPECTION OF BEARINGS

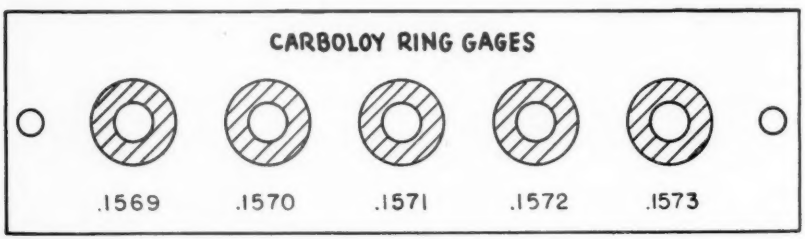
SMALL precision-type motors are assembled with bearings previously selected to match the diameters of the fits as the result of a method developed by R. R. Cameron, foreman at one of General Electric's plants. The method has given most accurate and satisfactory results.

New ball bearings as received are checked on a series of pin gages to classify them according to inside diameter. The gages differ in size by increments of .0001" and four pins cover the total tolerance allowed between high and low limits of the bearing I.D. With the total tolerance so divided, bearings may be selected as to class of fit on the rotor shafts, i. e., press, snug or loose. After each bearing is tried on a pin, it is placed in a tray marked with the size of the pin on which it was, for instance, a snug fit. If a loose fit or a press fit is desired, the bearing is simply placed in the tray identified the same as the pin on which it was a loose or press fit. Additionally, the bearings destined for each tray are checked on a comparator dial gage for outside diameter and are placed in rows within the tray according to .0001" variations in the O.D.

A comparator plug gage is used to determine the size of the bearing seat in the motor end shields and a suitable bearing is pressed into place. Not only is this bearing chosen from the correct row in the tray to fit the end shield, but the particular tray identification as to I.D. is noted.

The class of bearing fit on the shafts of rotor cores is likewise selected to match the bearings. Each shaft end is checked by a series of Carboloy ring gages differing by .0001" steps in size. Depending on the fit desired, the proper shaft is chosen to fit the bearing.



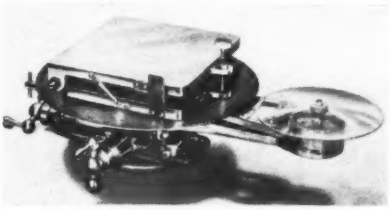


With the bearings classified according to both outside and inside diameters, the proper size bearing as regards both the shaft and end shield at hand can be chosen easily and hence the assembled unit has the desired accuracy.

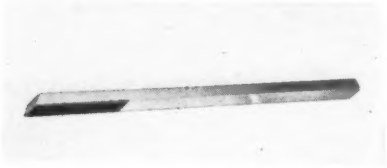
This system is very flexible as any type of fit or combination of fits can be obtained.

PROGRESS ON PARADE

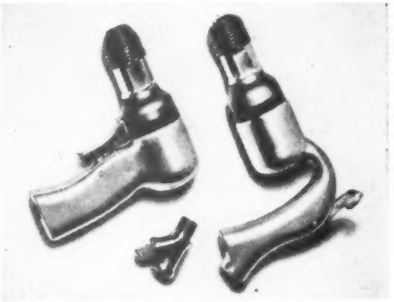
A QUARTZ ORIENTATION TABLE is used in positioning the quartz for accurately cutting the crystals used in electronics. The table can be securely anchored in position on the saw table; simple cross-adjustments are provided under the table for positioning horizontally. A screw and scale are provided for tilt-adjusting the top plate. These features, together with the clearly visible 10½", 360° dial primary rotation scale and the accuracy of the extremely sensitive compound adjusting mechanism, make possible the simplest and most positive orientation of piezo-electric quartz crystals yet devised, according to Robert H. Clark Co., 9330 Santa Monica Blvd., Beverly Hills, Cal. **92-H**



METAL BONDED DIAMOND FILE or hone with 100 concentration is now being offered by Diamond R Agencies of Pasadena 17, Cal. The Diamond R file has wearing qualities comparable to those obtained from a metal bonded wheel over a resinoid bonded wheel and, according to the manufacturers, will outwear five ordinary resinoid bonded hones while retaining a flat filing surface at all times. Its small size makes it possible to reach formerly inaccessible places and it can be used to resharpen all tungsten carbide tools. **867-H**



AIRCRAFT RIVETING HAMMERS achieve, by a combination of such factors as compact size, well-designed contours, smooth finish and light weight, smooth, easy operation with minimum effort. The arrangement of the valve mechanism and porting drives the piston with a high degree of efficiency, reducing shock and vibration to a minimum and providing power substantially in excess of ratings. On the offset handle the long two-finger trigger bar, with its metering throttle valve, controls the speed and number of strokes, resulting in greatly reduced hand and finger fatigue. Forss Pneumatic Tool Co., 1827 Broadway, Rockford, Ill. **868-H**

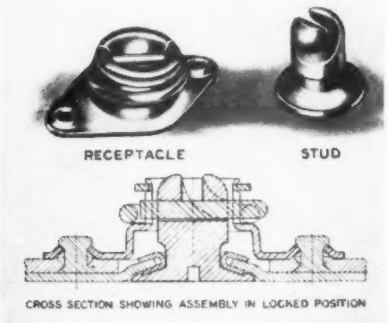


NEW TYPE BORING TOOL. The Shear-cutter Boring Bit is a radically different type of boring tool that is claimed to give diamond boring machine results with an ordinary lathe. This new tool has a circular cutting edge that lasts 10 to 30 times as long as a straight edge cutting tool before resharpening is necessary. The shearing (instead of conventional wedging) action of the tool leaves a curled chip and allows heavy cuts to be taken without chatter. When an edge becomes dull, no new set-up is required—a new

edge is supplied by simply turning the bit in its holder. The new boring bit requires less power and generates less heat because of the shear cutting action. The mirror finish this tool produces in one operation usually eliminates any necessity for grinding, filing,

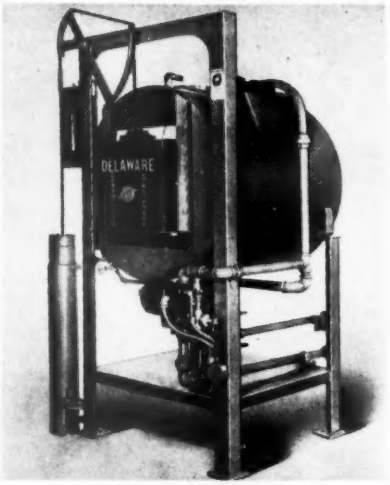
reaming or polishing to remove tool marks. This boring bit works well with either a positive or negative rake and permits working to closer limits than normally possible. Write to the SHEARCUT TOOL CO., 19600 Sherman Way, Reseda, Calif., for detailed information. **872-H**

A LIGHT WEIGHT FASTENER, particularly designed for securing aircraft engine cowlings, is also suited to many postwar commercial applications such as access plates on farm



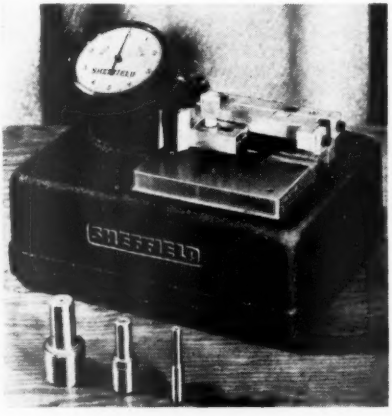
machinery, panels on motor trucks, home heating units, radio equipment, etc. Elastic Stop Nut Corp. of America, Union, N. J., offers technical data covering tests, applications, and sizes available. **279-H**

CONTROLLED ATMOSPHERE FURNACE—An ingenious design for heat treating furnaces is that embodied in the muffle and hearth tile arrangement of the Delaware controlled atmosphere furnace. The muffle is seated within the center of the combustion chamber tile. The work hearth tile is bridged within the muffle with front and rear legs so placed that the work load is carried by the work hearth tile rather than by the muffle. Through this method of muffle and hearth tile placement, the hearth tile will at all times have the same temperature as the thermo-



couple. Delaware Tool Steel Corp., Wilmington 99, Del. **155-H**

A PRODUCTION TYPE LEADCHEK by Sheffield Corp. of Dayton, Ohio, is designed for the rapid and accurate checking of large quantities of threaded parts such as aircraft components, studs and small shafts. Thread lead can be checked to an accuracy of .0001" many times more rapidly than by any other method it is claimed. It will handle threaded lengths up to a maximum of 2". Threads as fine as 40 pitch or as coarse as 2¼ threads per inch may be checked. **24-H**



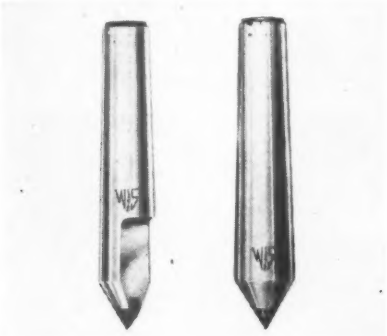
THE BARGAR SAFE-AIRE, designed to provide a simple, flexible and inexpensive dust collection system, will normally handle the dust from two 9" grinding wheels, whether they are mounted together or separately. It has a capacity of 600 cfm and one of its most important advantages is that it does not ex-

haust any air from the shop, but returns it approximately 97% clean and slightly warmer than before. Since it has been estimated that in the average shop it costs approximately $300 a year to replace 1000 cfm of heated air, the Safe-Aire effects a real saving in space heating costs. **202-H**

PROTECT-O-METAL NO. 7, a brush-on compound, protects jigs and fixtures from weld spatter. In resistance welding it prevents die sand welding holder jaws from becoming jammed with spatter. One coating

remains effective from ten days to two weeks. Whenever desired, it can be quickly removed from the jig by washing with water. George W. Smith & Sons, 79 S. Sperling Ave., Dayton, Ohio. **869-H**

W-S CENTERS AND HALF CENTERS enjoy long service life by the extension of the carbide insert into the shank of the tool. This extension is approximately equal to the exposed portion of the tip, thus allowing extra regrinds before replacement should the bearing surface of the tip become damaged. Be-

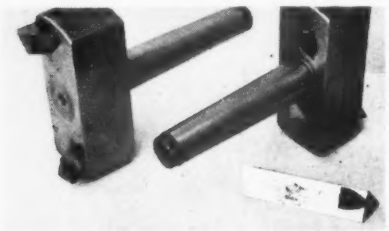


cause of the special precision manufacture, these lathe centers are guaranteed to a concentricity within .0002", thereby permitting close tolerance finish grinding and turning. The lathe centers are stocked in standard tapers by the Wendt-Sonis Company's Hannibal, Missouri plant. **518-H**

HOOVER-RISER. Cutting a spline in a sleeve required a dividing head setup and consequently a greater tool-to-table clearance than the standard Bridgeport in the illustration

provides. Installation of a Hoover-Riser, which adds 6" to the overhead clearance, made practical the handling of the job on this precision machine. Installation of the Riser, which is recessed and drilled to fit the Bridgeport, forestalled the necessity of putting the work on a larger machine. Manufactured by the Hoover Tool & Die Co., 20556 Hoover Road, Detroit, Mich. **480-H**

TRI-BITS, manufactured by Weddell Tools, Inc., 1239 University Ave., Rochester 7, N. Y., have been applied to fly cutters, made with one or more teeth, set at suitable rake and shear angles. They are being widely used for high speed milling operations, particularly



for milling aluminum or magnesium or carbide milling of steel. The cutter blades (Tri-Bits) may be ground for either roughing or finishing. Also, one blade may be ground to cut on the diameter for roughing; the other is set ahead on the face and ground under diameter with a lead, for finishing. **804-H**

OAKITE COMPOUND NO. 86. Previously restricted for exclusive use in war plants to meet production requirements for the better bonding of organic finishes and the prevention of rust in preparing steel parts for painting, lacquering and similar finishes, a new acid-type detergent, designed to clean and condition ferrous metals, has just been released to all types of metal working plants by Oakite Products, Inc.

Developed primarily for use in automatic washing machines, this new material, known as Oakite Compound No. 86, is reported to combine, in one operation, effective detergent action with special rust inhibiting surface treatment. The material thoroughly removes light spinning compounds, drawing lubricants, machining oils, grease, finger marks and shop dirt and, at the same time, deposits on the work a microscopic crystalline coating which provides a base for the firm bonding of subsequent paint, lacquer and similar finishes. It contributes to faster production by eliminating the need of preliminary alkaline degreasing often required heretofore in preparing steel for organic finishes. Another of its outstanding advantages is the prevention of rust on parts between operations.

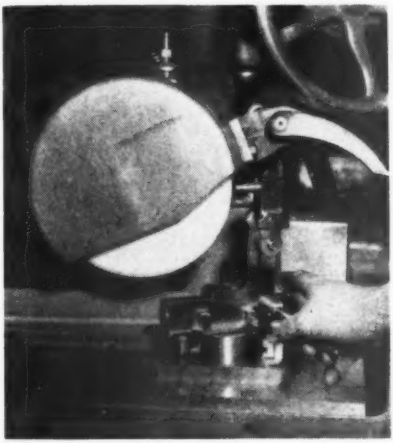
A Special Service Report, describing the material in detail, method of using and its application, is available on request to Oakite Products, Inc., 57 Thames Street, New York 6, N. Y.

CONTINUOUS PHOTOGRAPHIC PRINTER—designed to take full advantage of the time-saving features inherent in semi-photographic reproduction processes, the Bruning 55C provides clear and faithful duplicates of any-

thing typed, printed, photographed or drawn. Blueprints, layouts, maps and engineering data are quickly and easily reproduced. It may be used either inside or outside of the dark room and prints on either roll stock or cut sheets. Charles Bruning Co., Inc., 4700 Montrose Ave., Chicago, Ill. **870-H**

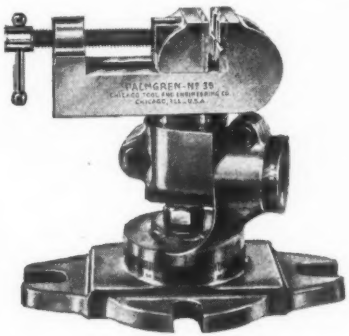
RADII AND ANGLE DRESSER. The Model B Radii and Angle Diamond Dresser, manufactured by the J & S TOOL CO., 477 Main St., East Orange, N. J., is a precision dresser for use on universal surface and cylindrical grinders. A high degree of skill is not required to operate this instrument. One setting will readily produce any one of the fol-

lowing: one angle, two angles, concave radii up to 6", convex radii up to 4½", two angles and radius, and innumerable other diversified forms are obtainable to conform to the grind-



ing profile. The wheel size range of Model B is 4"-14" diameter and its angular travel is 3". Further particulars are available on request. **339-H**

UNIVERSAL GRINDING FIXTURE. A neat, compact and universal fixture for grinding carbide-tipped tools, for holding grinding wheel dressers and also for the precision grinding of small parts combines the well-known Palmgren Vise on a newly devised,



universal base. Positioning of the work anywhere about three mutually perpendicular axes is quickly and easily accomplished by means of the three full 360° graduated adjustments. Positive, accurate and unrestrained locking means are provided for all rotations. The base is of generous area thus insuring stability, and two pairs of "hold-down" slots conform to any arrangement of machine table T-slots. Currently, prompt deliveries are being made of this tool.

Further information can be obtained by writing the Chicago Tool and Manufacturing Company, 8388 South Chicago Ave., Chicago, Ill. **591-H**

BURR REMOVING AND CHAMFERING TOOL. An announcement has recently been made by the Nobur Manufacturing Co., 912 No. Orange Drive, Los Angeles 38, Calif., that their burr removing and chamfering tools are now being manufactured with the pilot shafts hard chrome plated. When used in a drill press, lathe or other machine spindle, the Nobur tool is kept continuously in motion while parts are fed to it as fast as the operator can handle them. It consists of a cylin-

drical shaft which pilots into the hole to be de-burred. A knurled collar at one end of the shaft is a free-rolling ball bearing unit that can be grasped and held by the hand while the shaft is rotating. The burring blade may be advanced into cutting position or withdrawn by sliding the collar up or down. The hard chrome treatment increases the life of the shaft and presents a surface that is resistant to wear when used on various abrasive and hard materials. **164-H**

INDUSTRIAL DIGEST

SCIENCE • RESEARCH • METHODS • TOOLING
PRODUCTION • TRADE NEWS AND REPORTS

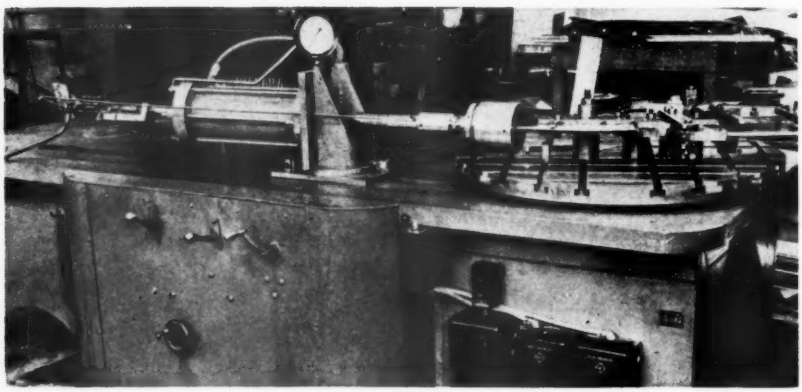
G-E Standards Policy Committee

A General Electric Company Standards Policy Committee consisting of engineers, general superintendents and representatives from appliance, electronics and lamp departments has been formed to maintain high engineering and manufacturing standards and approved practices throughout the company. The committee, headed by Standards Division Manager L. F. Adams, will review and determine the adequacy of all standards before approving them for general company use. It will work with existing committees of recognized standing in their respective fields in making studies of proposed standards or developing new ones. American standards approved by ASA and other accepted standards developed by AIEE, ASTM and SAE will be continued in use in so far as they are applicable. After being approved by the new committee all new and revised standards and practices will be published and distributed in the G-E Standards series.

Goodyear Roto-Stretcher

A machine for forming metal parts by bending and stretching has been developed for Goodyear Aircraft Corporation under the direction of J. S. Nielsen, Manager of Experimental Tools and equipment.

The Roto-Stretcher, as it is called, employs linear and rotary motion to do its job of combined bending and stretching. These motions or forces are attained thru the medium of a rotary table and hydraulic cylinder and piston. The table is generously t-slotted to accommodate any multiplicity of forming fixtures and clamps and the hydraulic piston terminates in a chuck for gripping the work. Because of the control that can be exercised during the forming operation, parts are formed without wrinkles. The springback, or change in shape after the part leaves the machine, is negligible, so that uniformity is assured even when contours up to 360° are involved. The Roto-Stretcher is said to have paid for its cost in a single week's operation.



New Safety Council Service For Small Plants

The National Safety Council has announced a new membership service designed exclusively for industrial organizations with 100 or fewer workers. The service was planned after a survey of several hundred small plants in seven industries revealed that the accident frequency rate in them was 47 percent higher than in larger plants in the same industry, and that in every case the average frequency rate was greater than for the industry as a whole. The council hopes by this service to be able to prevent many of the evils resulting from accidents—disrupted production, lowered worker morale and efficiency, ruined tools, wasted material, higher insurance costs, etc. Membership will include a safety manual containing valuable information and suggestions, supplies of accident prevention charts, safety inspection check lists, poster service, subscription to the Council's "National Safety News" and a number of other services. Where there are community safety councils memberships will be accepted exclusively through them; from other areas inquiries may be made direct to the National Safety Council, 20 N. Wacker Dr., Chicago 6, Ill.

Post-War Aluminum

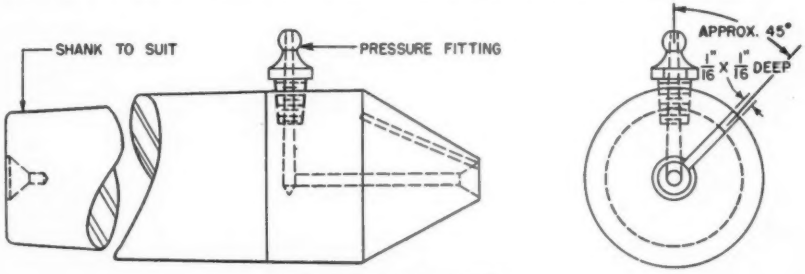
The War Production Board has announced, as of January 25, 1944, a new policy permitting the use of aluminum for post-war experiments. Heretofore, the Aluminum and Magnesium Division of WPB has refused requests for allocations of the light metal for experiments to work out models for civilian goods after the cessation of hostilities.

Under the new policy, the Division will approve requests for small amounts of aluminum for experiments provided they can be carried out without diverting manpower, technical skills or facilities from activities connected with the war effort.

All grants of materials in application of the new policy will be carried out within the provisions of Aluminum Conservation Order M-1-i, which is the order controlling the allocation and use of aluminum and aluminum products.

Lubricated Lathe Center

A specially lubricated lathe center devised at General Electric's Pittsfield Works prevents shaft centers from "picking up" when machining heavy shafts. The lubricant is introduced into the center hole of the shaft by a pressure gun through a fitting on the shank of the lathe center. It is forced into the shaft center and "full" is indicated by the overflow of lubricant along a $\frac{1}{16}$" x $\frac{1}{16}$" groove on the outside of the lathe center. As the shaft turns, the lubricant is wiped around the shaft center. The groove is positioned, at approximately 45°, where there is relatively low pressure between the machine center and the shaft center. This insures the best possible adhesion of the lubricant to, and scavenging of foreign matter from, the shaft center. With this arrangement, the shaft center can be lubricated while a cut is being taken and it is easy to keep the centers clean.



LUBRICATED LATHE CENTER

FISHER BODY TOOL CONTROL SYSTEM

A TOOL control system, designed to increase the efficiency in grinding, inspecting, storing, maintaining, salvaging, and disbursing of cutting tools has been installed at the Grand Rapids Stamping Division of Fisher Body. The system has made it possible to maintain high machine production, to consistently raise the quality of the finished product and decrease the amount of scrap and deviations, as well as increase the life of cutting tools.

The system was an outgrowth of the known fact that cutting tools will last much longer and perform better if they are regularly inspected and sharpened. To accomplish this point a plan was evolved whereby sets of tools would be scheduled to the machine according to the operation to be performed on those machines. The tool sets comprise the entire complement of tools necessary to complete the operation. The length of time which a set of tools remains on a job was determined by an actual performance check which governs the replacement cycles upon which the tools are scheduled to and from the machines. Grinding and disbursement cribs, along with the tool bank storage, are centrally located within easy reach of all machine areas. Dispatching of all tools to and from machines is controlled by the Production Scheduling Department and deliveries are made by routed trucks which also maintain a regulated schedule.

Tool sets, returned from the floor, are inspected upon receipt. Damaged, broken, and worn tools, along with those which need sharpening are removed and a tool replacement slip bearing the code numbers of the tools is placed in the box. The containers then pass along a conveyor to the bank stock area. Perfect replacement tools are added to the set after which it is passed along the conveyor to the disbursement crib for storage until needed.

Dull tools, after being removed from the sets, are ground and honed, rigidly examined, sealed and replaced in the bank stock to await future use. The tool control system has enabled the Grand Rapids Stamping Division to maintain high production sharpening of precision cutting tools as well as conserve tools and reduce lost time in man hours and machine hours on the production operations.

INCOME TAX FILING AID

WITH the March 15th Federal tax payment already a chief source of worry to the average worker, employers in the interest of employee morale and as a means of maintaining their production schedules are giving serious thought to ways of aiding the worker with this problem.

Due to inauguration of the pay-as-you-go plan, the 1943 income tax to most people is actually more of a settling up process than the 'pay-up' project of other years. To the new workers, filing for the first time, the March 15th payment may represent a large amount. Many employers will find it decidedly to their best interests to make arrangements through their local collector of internal revenue to have a deputy collector stationed in the plant. This method will speed up the filing and cut down the absenteeism that must certainly result if employees wait until the last minute to file their returns.

GAS TURBINE PROSPECTS

THE gas turbine as an efficient prime mover is not yet here, but operating results of thousands of turbosuperchargers on American airplanes are paving the way to the higher temperatures needed for its development, according to Dr. Sanford A. Moss, General Electric Company consulting engineer. However, whether the gas turbine will be able to compete with other types of prime movers when it arrives is a matter of speculation only, he adds.

The reason is that the same progress in higher temperatures will lead to better efficiencies for steam turbines and diesel engines which the gas-turbine prime mover would seek to replace, according to Dr. Moss.

(TO PAGE 140—PLEASE)

FORMING TOOLS of tough Meehanite Metal successfully replace critical forgings

Forming tools, cast from Meehanite, ready to be tipped with carbide, are now available. We are furnishing them to an increasing number of users, supplementary to our line of Victory Tool Shanks.

In shop after shop, these tough Meehanite Forming Tools have demonstrated their ability to stand up in severe service. In certain respects they are preferable to forged tools. There is no limit to possible shapes and sizes. Cast accurately to shape in only a fraction of the time required to produce forgings, they are finish-machined very easily and quickly. They save critical forging steel and are substantially lower in initial cost.

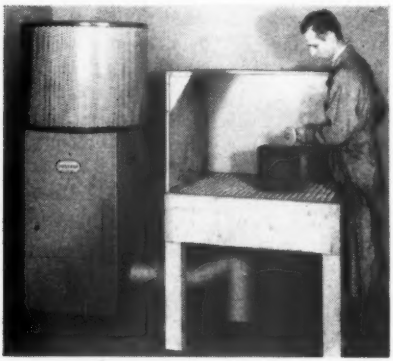
Any company equipped to tip its own tools is invited to ask for our new catalog No. 53-T-2. Outline your tool needs and send dimensional drawings when you write. Just address The Cooper-Bessemer Corporation, Dept. J, Mount Vernon, Ohio, or Grove City, Pa.

Cooper-Bessemer

New Dust Collecting Benchkop

A NEW, portable and entirely self-contained unit for collecting dust from flexible shaft grinding, and lint and dirt from similar buffing and polishing operations is added to its line of dust collecting equipment by Aget-Detroit Company, 617 First National Building, Ann Arbor, Michigan.

Important features of the new unit, which can, because of extreme simplicity of installation, be in full operation within a few minutes after uncrating, are: a saving in heat, reduction in space, less time and cost for maintenance, and valuable interchangeability.



The new equipment consists of two separate units; the wood bench with backstops of sheet metal to stop heavy particles and add efficiency, and the self-contained Dustkop which has its own motor, fan, cyclone separator and filter complete. Installation is by merely connecting the intake of the Model 1250 Dustkop with the outlet of the bench.

Dust, dirt and lint drawn down through the 1,000 lb. capacity removable wood grill first encounters a horizontal baffle which spreads the suction of the air and also catches heavier pieces of work, as well as any tools which may be dropped through the grill. The heavier dust and dirt drop down through the funnel to the bottom of the stack, to be removed through a hand-hole cleanout, while the lighter dust enters the inlet of the Dustkop through the connecting pipe. A multiple bladed fan, direct driven by a 1½ hp motor, supplies ample suction at the working level and also sufficient pressure to assure high efficiency separation of the dust and air in the cyclone separator. The dust and dirt drops into a glass storage jar, while the cleaned air passes through the drum-type spun glass filter and recirculates throughout the working space for a considerable saving in heating.

Delano Institute of Plastics

Founded to acquaint the tool and die industry with the existing and potential possibilities of tooling for plastics, the Delano Institute of Plastics is now providing technical training in this new field for tool and die makers and for engineers and designers. Prominent engineers in the automobile and plastics industries, experienced in the specialized techniques of plastics mold construction and design, are lending active support to the school's program by serving as technical instructors in this two-year-old school.

ADVISORY COUNCIL

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In two 20-week courses, practical problems in plastics mold design and construction, and actual fabrication are studied. The general types of molds and mold styles, molding accessories, mold making, selection and hardening of steels, layout and detailing for the most practical ways for toolmaker to build molds, and plastics materials and part design as they relate to mold design and construction are thoroughly treated from the tool and diemakers' and designers' viewpoint.

Morning classes, 9:30 to 11:30, and evening classes, 7:30 to 9:30, held twice weekly in the school's auditorium, are supplemented by instructional tours through Detroit's major plastics tool shops and molding plants. Layout work, both in classroom and at home, is required of students.

OFFSET TOOL DESIGN CONSERVES METAL AND TIME

Important conservation of materials and machine hours has been effected by Thompson Aircraft Products Company of Euclid, Ohio, quantity producers of precision parts for aircraft engines, by an ingenious method of making offset type Carboloy cemented carbide tools.

In making the ordinary offset tool, the usual practice is to make the tool in two pieces, the tip and the shank. To make the offset it is necessary to mill away the side of the steel shank as shown in the accompanying sketch, Fig. 1. At

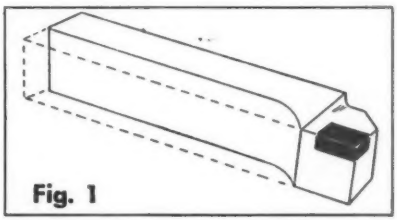

Fig. 1

TAPCO, however, such tools are now fabricated from three separate pieces, the head, shank, and the Carboloy cemented carbide tip. Both head and shank are of cast Meehanite for all types ¾" or larger. Used standard tool shanks are also being salvaged for this purpose. The various parts going into the assembly are shown in Fig. 2, including two pieces of "Easy-Flo No. 3" sheet stock which is the brazing metal used in the operation.

The head is cast in such a shape that it is ready to receive the tip. This eliminates milling to produce the offset, saving both machine hours and material, and also reduces the amount of machining necessary to provide a recess or seat in the shank for the location of the carbide tip. The Carboloy tip can be placed on either the right or the left side of the head. Thus the same heads can be used for either right or left hand offsets.

To braze the various sections of shank, the cemented carbide cutting tip, etc.,

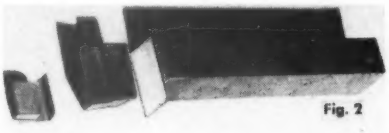

Fig. 2

the parts are assembled and clamped in a vise as shown in Fig. 3. The brazing operation is then performed with a torch. Brazing of carbide tips is not difficult and requires only the simple brazing equipment available in most shops.

These 3-piece, offset tools as prepared at TAPCO represent another large source of materials conservation because it is possible to use the same shank over and over again. When the tool has become worn out or obsolete, the old head can be removed and another head and tip brazed onto the same shank. Head removal is accomplished by clamping the tool in a vise and heating with a torch for

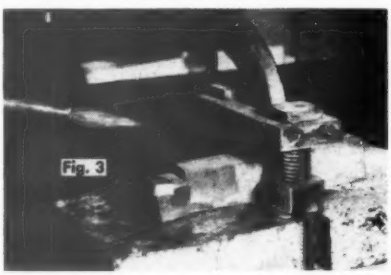

Fig. 3

a minute or so until the head drops off. Thus the procedure saves material and machining time both when fabricating the new tool, and when the tool becomes worn or obsolete.

Taylor and White's great discovery which made possible high speed cutting was the greatest single development to help make mass production possible. The steel developed, commonly known as 18-4-1, served industry faithfully for over thirty years without a serious competitor.

In the early 1930's the first molybdenum high speed steels were used on a substantial commercial basis and, before the Second World War, about 25% of all tungsten high speed steels had already been replaced by molybdenum high speed steels on merit. This steady progress of logical replacement of the tungsten steels was interrupted by the war because of the tungsten shortage, when many industrial plants were forced to a sudden change to molybdenum steels.

Because of the stress of war production many concerns have never had an opportunity to satisfy themselves thoroughly as to the comparative merits of the molybdenum high speed steels. For those, in this category, who are inclined to return to the tungsten steels, we suggest a serious consideration of the following facts—molybdenum high speed steels perform as well as, or better than, tungsten steels—and they cost less.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

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SALES AND TECHNICAL LITERATURE

Send Request on Company Letterhead

COATED ABRASIVES, their component parts, their manufacture and their ultimate use, including information on how to identify, order, and store sandpaper is contained in 28 pages of down-to-earth discussion published by the BEHR-MANNING CORP., Dept. TD, Troy, N. Y. This Basic Information Booklet for Users and Buyers follows closely on the heels of Booklet #1 for Distributor Salesmen. **110-H**

INDUSTRIAL SPRAY-PAINTING EQUIPMENT and Hose is fully described and illustrated in a recently compiled book published by THE DEVILBISS CO., Dept. TD, Toledo, O. A number of different pneumatic tools can be conveniently operated from a single air supply line with their detachable air hose connections. A positive, quick-acting air valve built into each DeVilbiss Quick Detachable Connection makes unnecessary the opening or closing of valves on the transformer or in the air line when interchanging tools. The new DeVilbiss Light-Duty Rotary Spray-Finishing Machine, Type YBL, is designed for the spray coating of an extensive variety of comparatively small parts, subassemblies, and other items made of metal, plastics, ceramics, glass, wood, or other materials. Information on Air Compressors, Spray Guns and Booths, and Dust Respirators is included. **267-H**

KUTMORE ADJUSTABLE HOLLOW-MILLS are the subject of Catalog No. 15 published by CARL WIRTH & SON, Dept. T, 1625 Clinton Ave., Rochester 5, N. Y. The two-way micrometer interlocking adjustment for moving the blades either way to cut smaller or larger diameters with absolute accuracy eliminates all guesswork in the setup. The time-saving locking device, actuated by only two screws, which holds blades in adjustment no matter how great the strain, insures continuously uniform performance. **853-H**

DOUGLAS TOOL ROOM MACHINES are detailed in a 4-page illustrated bulletin. Their Rotorex Universal Tool and Cutter Grinder, with its large assortment of attachments, is designed to do sharpening as well as production work such as cylindrical and internal grinding. The Douglas Precision Miller features a wide range of spindle speeds and reversible table feeds along with a complete selection of milling attachments. The Douglas Precision Slotter, equipped with swivelling ram head, automatic circular table and independent automatic feeds in all directions, is available with strokes of from 7" to 10". All three machines are built with a minimum number of working parts and conveniently located controls. Further information is available from DOUGLAS MACHINERY CO., INC., Dept. J, 150 Broadway, N. Y. C. **586-H**

EXPANSION BORING TOOLS suitable for all rough, semi-finish, and finish boring operations and reaming are described and illustrated in a catalog published by the LARKIN PACKER CO., INC., Davis Boring Tool Div., 6205 Maple Ave., St. Louis, Mo., manufacturers and designers of Boring Tools. Among the Davis tools other than the Expanding Block Type Boring Tool are: Micrometer "L" Type Tools—for rigid boring; Recessing or Grooving Tools—for inside grooving, recessing or chamfering; Fly Cutter Tools—for simple single cutter boring or line boring; Super Micrometer Tools—for extreme accuracy in single cutter boring; Car Wheel Tools—for boring railroad car wheels quickly and accurately, complete in one pass; Reamer Tools—for very fine finishing of a bored hole. Any and all features of the tools listed above

can be combined into a special tool according to requirements. **257-H**

TRACING CLOTH samples for ink or pencil work are contained in a catalog issued by ARKWRIGHT FINISHING CO., Dept. T, Providence, R. I. These tracing cloths are classified in two types: Type L, for ink work, with a highly glazed surface on one side and a dull finish on the other. The surface is of such character as to allow free use of drawing ink, without penetration to the basic

fabric, after not more than one application of talc, Fuller's Earth or similar abrading substance. Type 2, for pencil work, has one side sufficiently dull and rough enough to present a suitable "tooth" for pencil work. Ink may be used on this type cloth, though its primary purpose is for pencil use. Under proper atmospheric conditions, the transparency of these tracing cloths can be maintained for many years, in order that reproductions may always be made. **198-H**

FACTUAL INFORMATION ON metal-working, heat-treating and machining of armament is contained in a 34-page pocket size booklet No. 12 issued by E. F. HOUGHTON & CO., 308 West Lehigh Ave., Philadelphia, Pa. Included is data on what science has done for lubrication and on the prevention of rust by displacing water. The booklet also contains information covering blackened steel propeller blades by the use of Houghto-Black, Houghton's low temperature blackening salt which is being widely used for a black oxide finish for metal parts in war and peace-time use. This non-reflective black finish which retards corrosion has inspired its use on gun parts where a reflection would give away the location of the gun to the enemy. **324-H**

DORMAN TAPPERS in several sizes for drill presses or lathes are presented in a 4-page leaflet published by the DORMAN MACHINE TOOL WKS., Dept. J, 357 Canal St., N. Y. C. The Dorman No. 1 Friction Drive Tapper can quickly and easily (less than one minute) be adjusted from the lightest friction to absolute positive drive. This enables you to use one tapper for the smallest job in a soft metal such as aluminum, with light friction drive, and then by simple adjustment of friction, use same tapper with ⅜" tap in hard metal such as steel. All size Dorman Tappers are equipped with a Floating Chuck Jaw which automatically centers the tap and saves tap breakage and costly delays. **274-H**

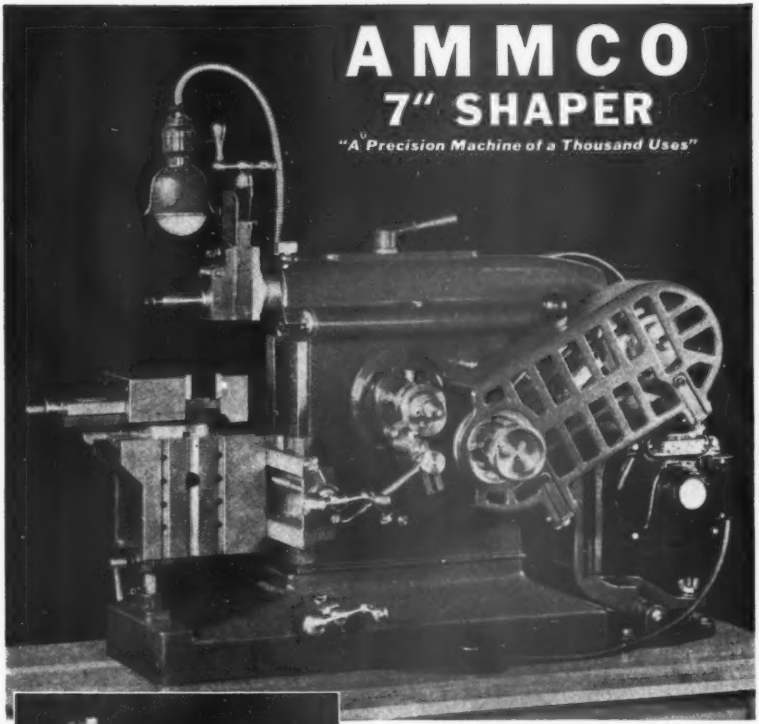
"INDUSTRIAL WIRE CLOTH. Engineering Data and Price List,"—a new technical reference book, is offered without obligation to industrial users of wire mesh and cloth, by the C. O. JELLIFF MFG. CORP., Dept. D, Southport, Conn. This 96-page pocket-sized booklet contains information on simplified ordering procedure facilitating shipments; explanations of different types of weaves in wire cloth, metals and alloys available; and laboratory and research facilities. Tabular material lists complete data on wire sizes, gauges, standard weights for each size of diameter for various metals and alloys, and methods of calculating weights of wire cloth. **861-H**

LATHES-BUFFERS-GRINDERS are described and illustrated in Catalog 24 issued by J. G. BLOUNT CO., Dept. D-4, Everett, Mass. Blount Grinders are recommended for grinding all tool steels. For working with new Tungsten Carbide tools, these grinders are furnished with a special wheel assuring rapid, easy production without burning or checking the tool. Model H. S. 10" High Speed Grinder is furnished with two adjustable work tables which can be quickly removed and the guards then can be adjusted so that the lower half of grinding wheel may be exposed for the grinding of flutes of hand and machine taps either for production or tool-room requirements. **213-H**

STANDARD MOLD BASES prevent costly errors in designing and mold making and minimize set-up time since clamps for one standard mold will fit all standard molds. The D-M-E Mold Base has many advantages and is designed to eliminate sagging or setting of the back-up plate by means of supporting pillars. Cavity Retainer Plates, adaptable to compression transfer and injection molds, can be ordered from stock as well as plates for compression molds. Further information is available from the DETROIT MOLD ENGINEERING CO., Dept. J, 4835 Woodward Ave., Detroit, Mich. **264-H**

QUADRO PRECISION LIVE CENTERS speed up production by eliminating friction while maintaining accuracy. These centers are designed to support heavy loads at top speed for long operations, particularly when used

AMMCO
7" SHAPER
"A Precision Machine of a Thousand Uses"



IT'S PORTABLE

- **Saves time and steps!**
- **Can be moved from job to job in tool and die shop!**
- **Just wheel up to bench--plug in--and go to work!**

On jobs requiring a stroke of 7" or less, the AMMCO 7" PRECISION SHAPER will enable you to save a lot of time and expense in a set-up which would be required for larger shapers. Furthermore, the AMMCO will enable you to get away from the cost of operating a big shaper on small work.

Portable Cabinet model enables this shaper to be moved about the shop.

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with carbide tools. Used on lathes, millers, turret lathes or other machine tools, they outlast dead centers many times and require less care in operation and maintenance. Further information is available from the DAKON TOOL & MACHINE CO., INC. Dept. TD, 838 Broadway, N. Y. 3, N. Y. **846-H**

MULTIPLE SPINDLE HEAD EQUIPMENT. Fixtures and Guide Bushing Plates are illustrated and described in Catalog "F" published by HOEFER MFG. CO., INC., Dept. J, Freeport, Ill. In addition to drilling operations Multiple Spindle Heads offer the same advantages for allied operations such as reaming, facing, tapping, hollow milling, threading, countersinking, counterboring, etc., in fact for any work now done on drill press or turret lathe and where holes can be worked upon in multiples. **308-H**

THE EUTECTIC WELDER is the brand-new house organ of the EUTECTIC WELDING ALLOYS CO. of 40 Worth St., New York 13, N. Y. This magazine will be published monthly with the first issue scheduled for mailing in January, 1944. It will be devoted to the dissemination of information on welding production, reclamation and salvage and the general advancement of Welding Metallurgy, design and practice. **81-H**

H & H PORTABLE ELECTRIC TOOL with reciprocating action for filing, honing, scraping, burring, lapping, sanding, chamfering, polishing or sawing is described and illustrated in an 8-page folder issued by the H & H RESEARCH CO., Dept. TD, 414 Marquette Bldg., Detroit 26, Mich. In operation this tool delivers 1000 strokes per minute. A complete line of accessories including files of many sizes and shapes, sanders, polishers, buffers, hones and saws is available. **307-H**

ARBOR PRESSES—hydraulic and hand operated—are featured in Catalog 39 released by the GREENERD ARBOR PRESS CO., Dept. T, Nashua, N. H. The 2 and 4-ton Greenerd Hydraulic is recommended for dry and wet broaching, assembling, straightening and general all-round work. No. 3G Geared Press—4 tons—is applicable to punch and die work as well as stamping. It has a substantial foot with a flat top that can be used with or without a plate. **616-H**

GROUND TOOL BITS AND TURNING TOOLS is the subject of an 8-page bulletin issued by the GORHAM TOOL COMPANY, Dept. J, 14400 Woodrow Wilson, Detroit 3, Mich. They are particularly applicable to automatic screw machine operations on alloy steels, turning crankshafts, mild steel forgings and in general all-around tool room and machine shop work. Gorham M-40-B Tool Bits and Turning Tools are especially effective in those applications where the use of a Super High Speed Steel is indicated. They are particularly useful in machining operations on heat-treated alloy steels where there are large amounts of stock to remove at high surface speeds. **799-H**

THE SELECTION AND CARE OF SAWS and other tools for wood and metal working is contained in a complete set of product manuals published by HENRY DISSTON & SONS,

KNOCK-OUT UNIVERSAL TOOL GRINDERS AND CARBIDE TOOL GRINDERS . . .

Are used the world over. Your plant cannot afford to be without one. Maintenance or production at a minimum time expenditure and capital outlay.

New illustrative literature for you. Write for: Bulletin UTG-43-TD for information on the K-O Universal Tool Grinder . . . Bulletin CTG-43-TD for information on the K-O Universal Carbide Tool Grinder.

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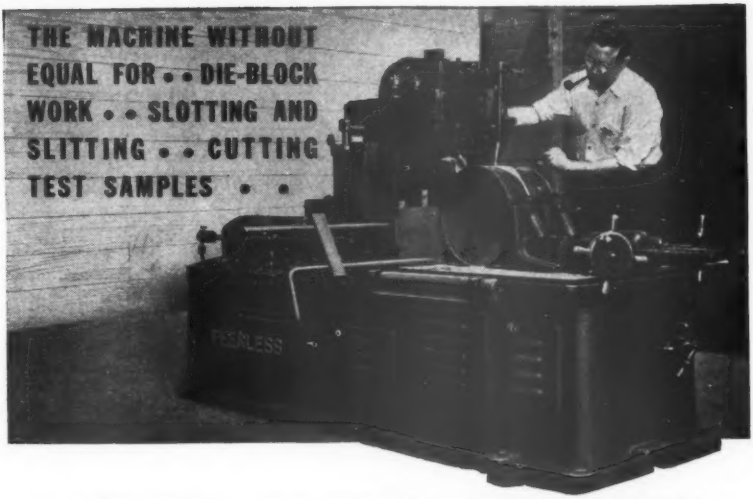
THE PEERLESS VERTICAL SAW



CUTS 10 x 24-INCH STOCK WITHOUT TURNING—LOADED BY CRANE

THE large work table permits loading the Peerless Vertical by crane. It is the only hydraulically controlled metal-cutting Saw that will handle 10x24 inch stock without turning the work

The Peerless cuts square and true all the way through. Only a few thousandths need be allowed for planing down. That enables tool and die makers to use scrap pieces for smaller dies, strippers and stripper plates and to salvage old die blocks. Critical stock is saved!

Mail the coupon for estimate of cutting time on your toughest operation and full details of the Peerless Vertical Metal Cutting Saw.

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Builders of Fine Tools for Thirty Years

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- ☐ Mail catalog covering Vertical Type used for Die Block Work
- ☐ Mail catalog on Hydra-Cut for High Production Cutting
- ☐ Mail catalog on Mechanical Type Saw for production cutting
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Company_____

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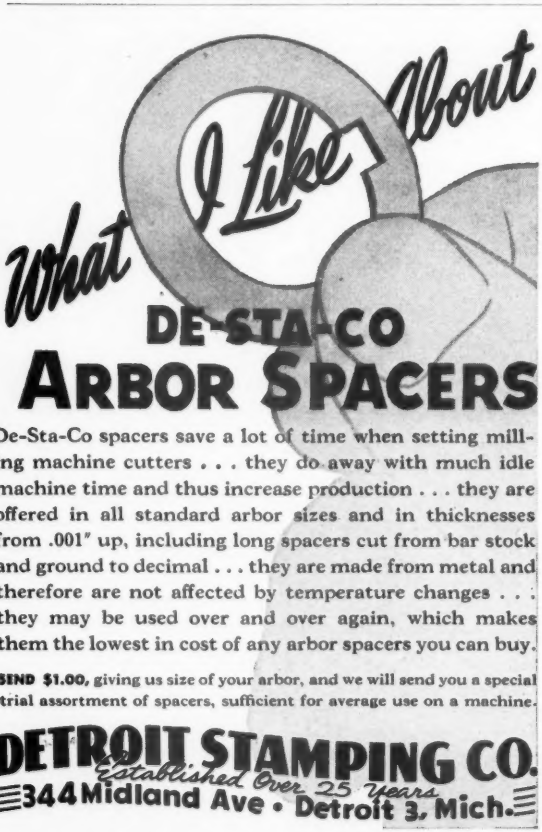
INC., Dept. TJ, Philadelphia 35, Pa. Their latest catalog, No. 100, deals with saws, tools, files, knives and other products used by industry. A saw designed for cutting heavy stock only and recommended for use in mills cutting shingle bolts and in paper mills for cutting logs to length is the Disston Spiral Tool Circular Cut-off Saw made of Disston Steel. An 80-page booklet describing the Disston Conservation Control Plan and showing reproductions of the control cards covering the failure, cause and correction of cutting tools is also available. **273-H**

MACHINISTS' VISES are described and illustrated in an interesting bulletin (No. 42) issued by the COLUMBIAN VISE AND MFG. CO., Dept. T, 9021 Bessemer Ave., Cleveland 4, Ohio. These vises are equipped with Malleable Iron Castings and are designed to insure maximum working strength and shock resistance. The steel screw and malleable iron nut are supported in rigid alignment to provide maximum gripping power and minimum wear on both the screw and nut. Steel balls on both ends of the handle are forged from the handle stock itself and cannot come loose. Hardened tool steel jaw faces, "T" section design for tongue-and-groove fitting, are pinned into the castings so they cannot come loose but may be replaced if chipped or worn. These replaceable jaw faces provide a solid gripping surface without screw holes or screw heads in the working face. **245-H**

THE WOLVERINE SPUN-END PROCESS—an entirely new method of forming tube which combines reducing, closing, necking, fabricating, wall thickening, etc., produces one-piece tubular parts with closed or partially closed ends. Virtually any design of end can be accomplished by using different shaped tools. The end can be a neck, semi-closure or complete closure. The wall thickness can be maintained or increased, and the wall can even be folded back on itself if desired. Most of the aluminum alloys, both common and high strength, and practically all the copper alloys which can be produced in tubular form, including the high and low brasses, can be successfully formed. This method of hot-forming by spinning to a predetermined shape without the application of external heat accomplishes a controlled plastic deformation as a result of the unique design of a simple tool or die and can be performed on lathes, screw machines, drill presses, spinners, etc. Further information is contained in Catalog E-1, "Spun-End Tube," published by CALUMET & HECLA CONSOLIDATED COPPER CO., 1415 Central Ave., Detroit, Mich. **19-H**

2-B HOT WORK DIE STEELS are presented in a pamphlet recently issued by JESSOP STEEL CO., Dept. J, Washington, Pa. These carefully melted and manufactured hot-working die steels will stand up under high pressure and severe working conditions. In addition to the 2-B Series, Jessop also produces other hot work steels for varying applications. "J" and "JJ" are excellent steels for various types of hot work dies, being specifically recommended for applications where forming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DE-STA-CO
ARBOR SPACERS
De-Sta-Co spacers save a lot of time when setting milling machine cutters . . . they do away with much idle machine time and thus increase production . . . they are offered in all standard arbor sizes and in thicknesses from .001" up, including long spacers cut from bar stock and ground to decimal . . . they are made from metal and therefore are not affected by temperature changes . . . they may be used over and over again, which makes them the lowest in cost of any arbor spacers you can buy.
SEND $1.00, giving us size of your arbor, and we will send you a special trial assortment of spacers, sufficient for average use on a machine.
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Established Over 25 Years
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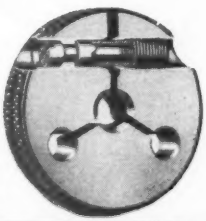
THE HOME of PERFEX Gages is the home of accuracy, because in this modernly designed and equipped plant accuracy has become a creed. A creed that only skilled men with years of making precision gages can adhere to.

It is by this adherence to accuracy that PERFEX has gained an enviable reputation among manufacturers who demand the best in precision built gages.



Perfex manufactures plain plugs, plain rings, thread plugs and ring thread gages. For delivery dates and prices wire or write us today.

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PERFEX GAGE and TOOL CO.

3604 GAYLORD DETROIT, MICHIGAN

is done by hydraulic or compressive methods. The Dica Series is especially suited for die casting of aluminum and aluminum base alloys while Top Notch has been designed for general applications up to 1000° F. For tools that must be tough, Jessop R. T. S. Water-Hardening Tool Steel has enough ductility, with high hardness and strength, so that it will show more than 5% elongation before it will break. **259-H**

PRECISION BUILT DRILL PRESSES are fully illustrated and described in Catalog No. 60 published by the CANEDY-OTTO MFG. CO, Dept. T, Chicago Hts., Ill. No. 3000-BV machines are designed for drilling accurate size holes within their specified range and can be furnished in two styles—bench model and bench with pedestal type legs in both single and multiple spindle units. The 21" Sliding Head Box Column Drill is equipped with four rates of power feeds. Feed rates are changed while the machine is in operation from controls on the feed gear box at the front of the head. A ratchet feed clutch lever makes it possible to disengage the feed mechanism for hand operation. A large graduated dial is provided for predetermined drilling depth together with an automatic trip for disengaging power feed at determined depth. **225-H**

REAMERS AND BORING BARS for speeding up production are illustrated in a bulletin issued by the WETMORE REAMER CO., Dept. D, 418 N. 27th St., Milwaukee 8, Wis. Incorporated features are: Rigid construction with patented blade lock and extra heavy blades which insures better finish without digging in or chatter, threads milled on centers, blade seats ground true with threads, and blades always bottomed, which permits holding to close tolerances. Blades are quickly and accurately set to the thousandth of an inch and may be set out 7 to 50 times, depending on size; heavier cuts may be taken because of rugged construction, scientific grinding and quality materials. **838-H**

LEGIBLE STAMPING!
with Matthews "Safe-Hed"
STEEL STAMPS
Matthews "Safe-Hed"*—"Tuf-Face"* steel stamps are used for marking all types of products . . . with trade marks, names, patent numbers, etc. Tell us how you want to use them and we'll make stamps to suit your stamping application.
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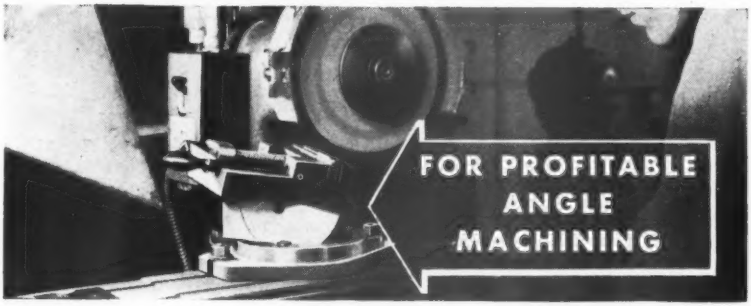
CWC SPEEDY POLISHING LATHES are described and illustrated in a 4-page leaflet issued by the CROZIER MACHINE TOOL CO., Dept. T, Hawthorne, Cal. On all models the entire motor is dust tight, thus excluding all abrasive material which is ever-present in polishing lathe work. Crozier speedy tool post turrets are available in three models: the "35" for bench lathes, the "41" for medium size lathes and the popular Model "61" for heavy duty. The method of indexing is the same on all models. The turret is revolved manually after "opening" the handle. The pre-location is determined automatically by a powerful detent mechanism. Close indexing is possible by reason of hardened pins closely fitted into holes in the hardened body. **255-H**

CARBIDE AND HI-SPEED CUTTING TOOLS, both standard and special, are presented in



ALL *Angle-Set* JOBS MADE EASY

PRECISION ANGLE GRINDING · MILLING · DRILLING · SHAPING · DIE-SINKING · SAWING · FILING · REAMING · SLOTTING · CHECKING

. . . and many other speedy Angle Set-ups for precision Tool-room or Production Operations. You save many vital hours . . . you cut costs four ways: (1) By speedy angle set-ups — (2) By angle accuracy that reduces spoilage or "rejects" to a minimum — (3) By making your present equipment adaptable to practical angle machining for every requirement — (4) By simplifying angle set-ups so that every operator is capable, with WESSON Universal Vises, of performing precision angle operations fast. Super-rigidity, wide range capacity, compactness, finest quality, precision engineered . . . a BIG value, at reasonable cost. INVEST NOW!

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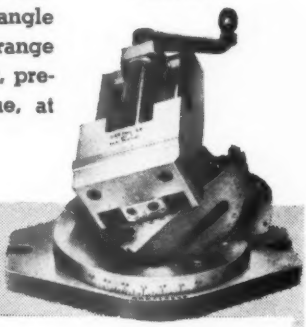

WESSON *Universal* **VISES**
BUILT TO WESSON STANDARDS OF QUALITY AND PRECISION

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Please send me illustrated bulletin of WESSON Universal VISES and ANGLE PLATES.

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a 16-page catalog issued by ARCHER & SMITH LTD., 125 N. Eastern Ave., Lexington 34, Ky. Tables showing specifications of right hand and left hand standard carbide tools are included. These tools will be supplied without chip-breaker unless otherwise specified. **786-H**

"HARDSTEEL" DRILLS have been very successfully adapted to the plastics industries. Drilling proceeds so fast that the heat generated is dissipated quickly and does not build up to the point where it will cause binding in the hole. "Hardsteel" drills make it possible to drill, counterbore, countersink, or ream hardened steel the same as soft steel. One of the most noteworthy applications of these drills is in the aircraft engine field. Further information is available from the BLACK DRILL CO., 1400 E. 222nd St., Cleveland, O. **588-H**

D & T TUBULAR MICROMETERS AND STANDARDS available in 43 sizes from 0" to 168" are illustrated in a 4-page pamphlet released by the DAVIS & THOMPSON CO., 6616 W. Mitchell St., Milwaukee, Wis. These large but light micrometers are furnished in either bar or bow types and have frames of hollow, cold drawn steel with drop forged ends welded on to hold the sliding ground bar and micrometer head. Available in nickel plate or crackle finishes, they are used in plants manufacturing heavy machinery and industrial equipment, such as electric turbines, locomotives, freight cars, rolls, etc. They are also used in steel mills, engine plants, paper mills, government arsenals, navy yards and by producers of armament. **21-H**

HYDRAULIC CYLINDERS for working pressures up to 1500 lbs. are illustrated and described in Catalog No. 233 released by the HANNA ENGINEERING WORKS, Dept. D, 1765 N. Elston Ave., Chicago 22, Ill. These cylinders are of simple design and extra sturdy construction. To further insure long life and freedom from maintenance worries, non-adjustable cushions at both ends are furnished with each cylinder as standard equipment and at no extra charge. Hanna HP Cylinders are offered in many different models to accommodate every type of mounting requirement. An alignment chart or nomogram giving horsepower requirements for hydraulic cylinders is one of many other engineering charts, tables and diagrams. **809-H**

HOLDEN NEUTRAL BATHS for hardening and tempering is the subject of a well-presented 26-page booklet published by the A. F. HOLDEN CO., manufacturers of heat treating baths and pot furnaces, Dept. K, New Haven 8, Conn. Neutral baths are compounds of properly selected chemicals designed to provide molten heating mediums that are inert to the work, will neither carburize nor decarburize, that are stable and which will operate 600° F above their melting points. **150-H**

1 MOTOR TOOL *LIVE* CENTER

WILL *Outlast* A BASKETFUL OF *Ordinary Centers*

The record established by MOTOR TOOL Live CENTERS over the past two years of strenuous war production has been ***remarkable*** . . .

Remarkable—because of the absence of burnouts and breakdowns in month after month *continuous* high speed operation . . .

Remarkable — because of the savings effected. With reasonable care and run at rated loads and speeds, **ONE** MOTOR TOOL Live CENTER *will* outlast a basketful of ordinary centers.

BUY UNITED STATES WAR SAVINGS BONDS STAMPS

MOTOR TOOL MANUFACTURING CO.

METAL CUTTING TOOLS

7783 CORTLAND AVENUE · DETROIT, MICHIGAN

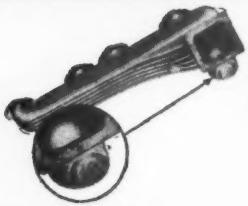
Make it a Rule to Call Motor Tool

"THREAD GRINDING SIMPLIFIED" is the title of Bulletin No. 25, in answer to the demand for "know how" information and increased war production, and just published by the DUMORE CO., Dept. TD, 14th and Racine, Racine, Wis., manufacturers of precision tool post grinders and handgrinders. This profusely illustrated bulletin shows typical thread grinding operations, samples of thread grinding done by the Dumore method, wheel dressing and the six simple steps required to mount a Dumore Number 5 Toolpost Grinder (of ½ hp and up to 42,500 rpm spindle speeds) and the Thread Grinder Attachment to lathes in preparation for thread grinding. Since it is possible to grind either U. S. Standard or Acme Threads with the Dumore Thread Grinding Attachment and the Dumore Number 5, complete helical angle tables for both types of threads are given for settings of both the grinder and dresser. **561-H**

PLUG, SNAP AND RING GAGES which prevent spoilage, speed-up operations, utilize less skilled help and reduce costs are quoted in Bulletin No. 22G issued by EASTERN PRECISION GAGE CO., Dept. T, Hersh Tower Bldg., Elizabeth, N. J. Their new snap gage has steel-ball-tipped anvils on one leg and a positive locking system which prevents movement of the adjusting screws and assures absolute permanence of adjustment, although easily loosened for resetting when desired. **848-H**

CONWAY GEAR TOOTH DRIVE DISC CLUTCHES in medium sizes are described and illustrated in Bulletin MGT published by THE CONWAY CLUTCH CO., Dept. TD, 1543 Queen City Ave., Cincinnati 14, O. The underslung construction of the Conway insures balance, centripetal action, drag-free idling, large lever ratio, full floating contact and absence of pins, toggles, springs and paraphernalia, which are sometimes a menace. Other Conway clutches, including the heavy duty disc clutch, compression clutch, one-revolution clutch and XYZ type clutch are illustrated in their respective bulletins. **248-H**

Castolin Eutectic
EUTECTIC*
(Means Lowest Binding Alloy)
LOW TEMPERATURE WELDING



NO GENERAL PREHEATING REQUIRED FOR WELDING CAST IRON

PROBLEM

How to repair this cast iron exhaust with a color matching, heat resistant weld? With high temperature, fusion welding there was great risk of stresses, new cracks, and distortion even in the hands of the most skillful welder. Bronze brazing could not be used since the job requires a perfect color match.

SOLUTION

Eutectic Low Temperature Welding Alloy No. 14 was tried. Its low binding temperature (950-1400°F) eliminated risk of stresses, new cracks, and distortion. Many jobs require only slight local preheat • Weld has high heat resistance • Easily machinable • Perfectly color matching.

* Reg. U. S. Pat. Off.

36 PAGE "KNOW-HOW" MANUAL V —WRITE TODAY!

EUTECTIC
WELDING ALLOYS COMPANY
Originators of the Low Temperature Welding Process
40 WORTH STREET, NEW YORK 13, N.Y.

GRINDING WHEEL DATA BOOK—published by the ABRASIVE CO., Dept. TD, Tacony and Fraley Sts., Philadelphia 37, Pa., discloses that frequent and proper sharpening of tools and cutters produces more accurate work and lengthens the life of tools. An excellent list of Production Rules for Efficiency is included. Borolon (aluminum oxide) and Electrolon (silicon carbide) Grinding Wheels in vitrified, silicate, shellac and resinoid bonds are described and illustrated. Cross sections of the standard types which are representative of practically all grinding wheels used on the standard makes of grinding machines are shown. The Abrasive Company Grinding Wheel Catalog contains list prices and rules for calculating list prices of grinding wheels and other abrasive shapes. **172-H**

The darndest machine you ever saw...

1 It has an interesting, complex oscillating motion. It works up and down following crank contours. And it does it all at once! It's the darndest machine you ever saw! Yet it is one of the most efficient and productive machines of its type. Its job is to finish all of the bearing surfaces on a crankshaft at one fell swoop! The older method of performing this same operation is to hold the abrasive cloth in a "nutcracker," finishing only one surface at a time.

2 With the new machine, strips of successively finer grits of abrasive cloth, having serrated edges to permit the strips to follow the fillets of the bearings, are automatically inched past the revolving crankshaft from a feed roll of the cloth. And on many a job it's Aloxite Brand cloth by Carborundum that gives the ultimate smooth, satin finish.

3 Further improvements in techniques of grinding, finishing, sharpening and polishing, developed through the facilities of The Carborundum Company, will be helping to produce still more for less, now as well as in postwar period. Remember abrasive products are "Weapons for Production." Use them wisely. The Carborundum Co., Niagara Falls, N. Y.

CARBORUNDUM
ABRASIVE PRODUCTS

Carborundum and Aloxite are registered trade-marks of and indicate manufacture by The Carborundum Company.

FOREDOM FLEXIBLE SHAFT MACHINES are described and illustrated in Catalog No. 30 released by FOREDOM ELECTRIC CO., Dept. T, 27 Park Place, N. Y. C. These versatile machines are particularly valuable for use on small irregularly-shaped parts which cannot be handled by conventional machine set-ups. When used for maintenance work, such as removing high spots on gears, touching up or sharpening tools or cutters while on a machine and other similar tasks, an expensive disassembly and reset job is eliminated. These machines are used for grinding, polishing, milling, drilling, sharpening, slotting, sawing, cleaning, sanding, scratch-brushing, de-burring, engraving, glass-etching, rust-removing, etc. They can be employed on all metals as well as on glass, plastics and wood. **563-H**

DOALL HYDRAULIC SURFACE GRINDERS, accessories and supplies manufactured by the SAVAGE TOOL CO., Dept. D, Savage, Minn., are illustrated and described in their new twenty-page booklet now being distributed to the metal working industries. With these surface grinders, unity of control throughout the whole grinding process is provided with the specially designed and constructed DoAll grinder accessories. Among these accessories are grinding wheels, selectron and electromagnetic chucks and wet or dry grinding attachments including a specially prepared soluble oil for wet grinding. Specifications and application data are shown as applied to either tool room or production grinding. **141-H**

FENN QUICK-ACTION VISES for milling, drilling, tapping and assembling operations are presented in a 4-page leaflet published by FENN MFG. CO., Dept. J, 1841 Broad St., Hartford, Conn. This time-saving, easy-operating, method of holding a piece of work securely and rigidly during any number of machine operations eliminates slow hand cranking to close the vise jaws on the material. A quick-action cam lever throws the jaws together instantly, uniformly, solidly; then the eccentric handle locks the work in a doubly secure grip. **291-H**

"WARTIME CARE OF CHAIN BELT DRIVES" is the title of Bulletin No. 435 just published by the CHAIN BELT CO., Dept. D, 1600 W. Bruce St., Milwaukee 4, Wis. It gives critical information on maintenance, lubrication and repair of chain belt drives during these wartime days. The booklet was produced with the idea of helping users in getting the most out of their existing drives and in saving costly delays and unnecessary expense. In addition to making chain belts for drive purposes, the Chain Belt Co. manufactures over 2000 types of chain belts for both drive and conveyor service, numerous types of conveyors and other engineering products and a complete line of construction machinery. **815-H**

How to TRAIN Tool Makers FASTER!

● Widely used throughout industry and trade schools, "Tool Steel Simplified" meets the urgent need for a complete, up-to-date text for training new men, "refreshing" older men, or trouble shooting in the tool room. Tells in easy shop language how to select tool steel, how to make tools, how to improve tool performance. It is available *at cost,* $1.00 per copy, to tool steel users in the U. S. A.

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315 Pages 205 Illustrations
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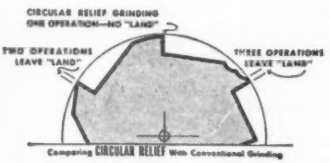
CONSERVE PRECIOUS TOOLS

With CIRCULAR RELIEF GRINDING!

ONE MACHINE is all you need to grind your valuable tools *the right way*... without needlessly grinding away metal that supports the cutting edge of the tool.

CIRCULAR RELIEF GRINDING *follows the contour* of the tool, leaving maximum support behind the cutting edge and contributing to longer tool life.

ONE OPERATION and one machine, instead of four operations and two machines... that's the CIRCULAR RELIEF way! It saves you time and labor as well as tools and money. Send for the free circular and get the whole story. You'll be glad you did!



Note from diagram how CIRCULAR RELIEF GRINDING *follows the curve* of the tool, grinds right up to the cutting edge, and does not cut away valuable metal supporting the cutting edge.

Send for Complete Information!

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TOOL ENGINEERING COMPANY

1261 W. Fourth St. Cleveland 13, Ohio

CARBIDE STEEL CUTTING GUIDE—A vest-pocket "handy guide" to top performance in steel cutting with carbides; covers the characteristics of different grades of carbides designed for steel cutting, selection of proper rake and relief angles, size of radius, etc. Major considerations as to machine requirements, speeds and feeds are given together with grades recommended for different types of steels. Design and grinding of chip breakers is dealt with in detail, as is the problem of supplying coolant in proper amounts and places. Of particular interest are the trouble-shooting suggestions to be followed in case of tool chatter. Operating hints and "Do's and Dont's" on carbide tools are contained in this 16-page pocket guide (Manual GT-166) issued by CARBOLOY CO., INC., Dept. J, 11109 E. Eight Mile Rd., Detroit 32, Mich. **82-H**

TUMBL-SPRAY METAL WASHING MACHINE, designed for removing chips, dirt, grease and oil from machine parts, stampings, screw machine products, etc. is the theme of revised Bulletin No. 9 published by AMERICAN FOUNDRY EQUIPMENT CO., Dept. J, 555 S. Byrkit St., Mishawaka, Ind. By means of its special patented endless tumbling conveyor, the Tumbl-Spray achieves complete exposure of work to the cleaning action of the high pressure sprays. Mechanical features, construction and operating details, and specifications are fully covered. Schematic drawings and diagrams are included to illustrate all important features and operating sequences. Short descriptions of the complete American Metal Washing Machine line, including the Conveyor-Spray, Monorail-Spray and Tabl-Spray Machines are also included. **730-H**

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SPRING PROBLEMS
● If you need special design, special quality or special delivery, the chances are we can help you. Redesign may modify costs, too. This specialized organization, recognized headquarters for all that is latest and best in spring making, is at your service.
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65 Years of Knowing How RESULTS IN BETTER SPRINGS
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INQUIRIES INVITED . . LARGE ORDERS . . SMALL

GE ELECTRONIC CONTROLS—their fundamentals and various applications—are interestingly described in a new 12-page bulletin (GEA-4126) recently issued by the GENERAL ELECTRIC CO., Dept. J, Schenectady, N. Y. This well-illustrated publication explains in clear, simplified language the fundamental principles of electronic tubes and their operation, describes the construction of the well known thyratron tube, and lists the functions of eight of the more widely used industrial-type tubes. Many practical applications of electronic control, including rectification, resistance welding, timing, and processing operations, as well as photo-electric installations involving counting, sorting, weighing, measuring, registering, illumination, and the control of cement kiln temperatures are included. Also mentioned are the various advantages afforded by the use of electronic control, such as flexibility, precise control, reduced maintenance, and quiet, faster, automatic operation. **77-H**

FOR *More Speed* IN DEEP DRILLING!

Use This Oil-Hole Drill!

ALL SIZES
from 3/8" to 3½"
in diameter and up
to 36" overall.

You can speed up deep drilling tremendously with the Super-Kool Oil-Hole Drill, for the simple reason that the Super-Kool keeps the drill cool by providing a constant supply of oil at the cutting edge.

By means of two oil holes which follow the twist of the drill the entire length of the shank, oil is forced to the base of the drill, keeping the temperature of the drill safely below the danger point.

Because of its cooling feature, the Super-Kool has a life two to three times that of ordinary drills—a point worth remembering if you are interested in cutting down your drill expense.

You will find also that the Super-Kool produces smoother holes—because the pressure of the oil forces the chips back through the flutes, eliminating the danger of scoring.

If you have a tough deep-drilling job, change over to the Super-Kool Oil-Hole Drill and see how it will quickly solve your difficulties.

Detroit Reamer & Tool Co.
2830 E. 7-Mile Road Detroit 12, Michigan

Manufacturers of

Oil Hole Drills . . . . . Special Reamers
Circularity Relieved Reamers and End Mills
—*Also* Special Tools

SUPER KOOL
OIL-HOLE DRILL

(CONTINUED FROM PAGE 118)

New Use for Arc Welders

Use of General Electric a-c arc-welding transformers to demagnetize steel parts, similar to the method used by jewelers in demagnetizing watches, has been announced by R. F. Wyer, General Electric welding engineer. Hitherto, in addition to the fabrication of metals, the d-c equipment has been effectively used to thaw out frozen pipes and warm up airplane engines. Wyer reports that a G-E arc-welding transformer equipped with stepless control is being used in the Chrysler tank plant in Detroit to remedy trouble caused by metal parts which have become magnetized. Five or six turns of cable are wrapped around a die, and carries a 60-cycle alternating current from a 500-ampere welder. The current is gradually decreased by turning the current control crank.

Unique Record for Efficiency

The federally-sponsored Steel Recovery Corporation, organized by a group of Pittsburgh steel men at the request of the War Production Board in the summer of 1942 to locate and route idle and surplus stocks of steel to rapidly expanding war factories, ended a short but useful existence on Dec. 31 after completing its work and setting a unique record for efficiency. Shortly before the corporation was liquidated, its president, Charles F. Cruciger, reported that it had effected savings on government purchases nearly equal to the entire cost of the agency's operation, and that only one percent of the $300,000,000 which it had been estimated the steel recovery program would require was actually spent.

The Steel Recovery Corporation quickly compiled inventories of idle steel and started it moving to war industries. Nearly a quarter of a million possible steel holders were asked for inventories of idle or excess steel in their possession, and the program was backed by WPB's authority to requisition steel when voluntary means failed. As a result millions of tons of steel moved into trade channels from idle stockpiles which had been frozen by war emergency or-

THE ABRASIVE DEVELOPMENT OF A DECADE

"Rubber-Cushioned" Brightboy

THIS BRIGHTBOY WHEEL was purposely split to show the even impregnation of the abrasive clear through its resilient rubber binder.

Abrasive - Uniform Throughout

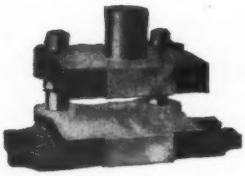
Gives Faster, Better DE-BURRING, FINISHING, POLISHING

Brightboy's finishing action frequently serves as the final polish. In operation, the abrasive recedes slightly into the rubber binder, the abrasive and the rubber joining in a combination finishing and polishing job.

Brightboy can achieve outstanding results for YOU. Made in wheels, and in rods and blocks for manual work. Ask your distributor for prices and for "Methods and Applications" booklet. Brightboy field representatives are at your service. Investigate Brightboy now.

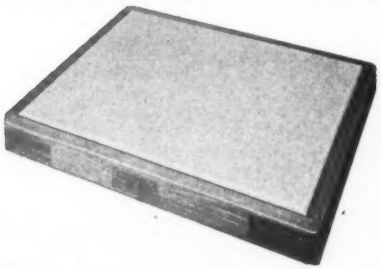
BRIGHTBOY INDUSTRIAL DIVISION, WELDON ROBERTS RUBBER CO., Newark, N. J.

WELDON ROBERTS Brightboy



BETTER
DIE WORK
with Producto Master and Standard
INTERCHANGEABLE DIE SETS

Master sets for finest, most accurate die work. Pins and bushings are hardened, ground and lapped to very close limits. Standard sets for ordinary die work are fitted with hardened and ground steel pins and bushings. Steel and semi-steel.



THIS TRUPLANE
STRUCTURAL GLASS SURFACE PLATE

1. *Remains Flat Indefinitely!*

2. *Outwears Cast Iron or Steel!*

SAVE TIME AND MONEY waiting for delivery of metal plates or resurfacing of your old plates by using this accurate, low cost structural glass plate. Precision lapped to over-all flatness of less than .0002". Does not warp or twist. Low co-efficient of expansion leaves it unaffected by temperature changes, guaranteeing you greater accuracy. Non-magnetic and non-corrosive. Hard surface can be scratched but scratches raise no burr and do not affect accuracy of plate. Instruments do not stick to surface. Truplane plates are lighter and easier to handle than cast iron. Mounted in hardwood case with cover to protect surface and edges.

PROMPT DELIVERY

Stock sizes for immediate delivery include 14" x 18", $49.00; 16" x 20", $58.25; 20" x 24", $87.50, F.O.B. Cleveland. Ten days delivery on sizes not in stock. Send coupon for full story.

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ders. During the peak period of its operation the corporation received reports of 10,000 items a day and 5,000 inquiries from prospective purchasers each month. The agency functioned principally as a clearing house for buyers and sellers and itself purchased materials for vital needs of the armed services. In one instance reported by Cruciger, when materials were needed for service men's identification tags and chains, the Steel Recovery Corporation located and purchased a large amount of stainless steel from refrigerator ice pans to substitute for silver, and a saving of thirty cents per unit was effected on government orders totaling seven million units.

The program located materials for the manufacture of farm equipment, gasoline drums, structural steel and plates for ships, and many other urgently needed articles. Originally it had been expected that a large percentage of recovered steel could be resmelted, but this was later considered uneconomical except in cases of urgent wartime demand and only approximately ten percent of the total amount was resmelted. Most of it was reprocessed from unusable to needed forms by rerolling, shearing, slitting and other methods.

The steel recovery program reduced the inventory of idle steel, estimated at from twelve to fifteen million tons in 1942, to comparatively modest and manageable proportions. The corporation will complete outstanding contracts and future redistribution of steel will be carried on by regional offices of the War Production Board.

Our Services

Flame Hardening · Annealing · Aerocasing · Bar Stock Treating and Straightening · Heat Treating · Pack or Gas Carburizing · Sand Blasting · Chapmanizing · Tempering · Cyaniding · Nitriding · Hi-Speed Hardening.
Physical, Tensile and Bend Tests.

THE LAKESIDE STEEL IMPROVEMENT CO.
5418 Lakeside Avenue CLEVELAND, OHIO Phone Henderson 9100

Henry E. Miller, President of Chicago Wheel & Manufacturing Co., died at his home on January 10 after a brief illness.

Mr. Miller was one of the oldest men, in years of actual experience, in the grinding wheel industry and was one of the founders of the Grinding Wheel Manufacturers Association. Because of bottlenecks which occurred in war production two years ago, Henry Miller concentrated all the facilities of the Company on sizes 3" in diameter and under. The plant today flies the Army-Navy E flag as a result of this concentration of production and its success in normalizing deliveries of its products to essential war industries.

Henry Miller's son, Arthur J. Miller, has been identified with his father in business for many years and will continue to direct Company affairs.

SHOP AIDS

and BOOK REVIEWS

ARC WELDING INSPECTION CHART. A large and very comprehensive wall chart illustrating, photographically, fillet and butt welds as made under a variety of conditions is available from the Lincoln Electric Company of Cleveland, Ohio.

There are eighteen large reproductions of fillet welds showing most distinctly the improper appearance of work when caused by such welding conditions as: current too low; current too high; speed too slow; speed too fast; arc length too long; arc length too short. Each of these incorrect conditions of current, speed and arc length is shown in combination with correct or normal appearance of the other two.

In the section of the chart devoted to butt welds there are shown seven different examples of butt welds, and a table of weld characteristics is keyed to the photographs so that the welder can check his work as to: arc current; arc volts; arc speed; burn-off of electrode; penetration fusion (crater); appearance of bead; arc sound. The welds illustrated are so distinctly different and the table is so concise that the operator can immediately diagnose his work and attain the best results with the least expenditure of time, effort and material.

The third portion of the chart covers "fleet-fillet" welding technique. Full explanation is given as to that it is; what it does; advantages; where used; both by text and illustration. Comparative line drawings and photographs identify the "fleet-fillet" type of weld and illustrate the method of using it. In many cases, specifications call for single pass, down-hand fillet welds made in conventional fashion, yet the "fleet-fillet" technique will be used on the job. Hence, a table has been compiled for ten sizes of conventional fillet weld. By reference to this conversion table the welder is given: electrodes size, current value, electrode burn-off rate and arc speed necessary to attain a size of "fleet-fillet" weld of equivalent strength. **597-H**

TREATISE ON PLANERS. This book, published by a leading planer manufacturer, covers the various aspects of planer design, construction, and operation. Years of experience in the planer field have made this company aware of the problems of planer operation, and this book contains many examples of unusual jobs where some aspect of the handling should enlarge the knowledge of every planer operator. Even though he may not ordinarily be called upon to handle an operation of equal magnitude, many of the "tips" which may be obtained by a study of the more involved planer operations illustrated in this book may be profitably utilized by planer operators on simpler jobs.

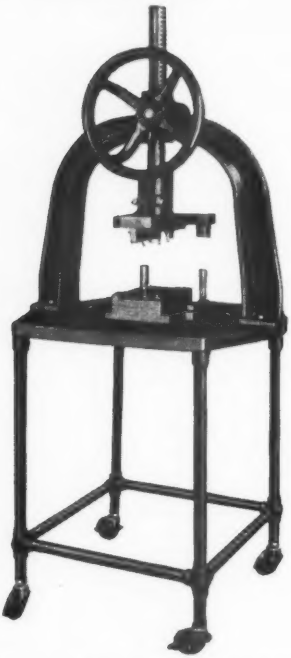
The book covers the early history of the planer, and contains a keyed photograph identifying the parts of the modern planer. Chapters are devoted to "Tools for the Planer", "Setting up Work on the Planer", "Cutting Speeds", "Examples of Planer Work", and "Details of Planer Construction".

In this second edition the TREATISE ON PLANERS stresses modern improvements of the planer, developed during recent years. Everyone who owns or operates a planer should be interested in acquiring this book, as a means of keeping abreast of modern developments in planing, as well as learning the most advantageous methods of operating the newer planers. The 133-page, well illustrated and indexed book is offered in a cloth-bound cover at the nominal charge of $1.00 and may be ordered from the Cincinnati Planer Company, Cincinnati 9, Ohio.

LIGHTING HANDBOOK. Because of the demand for information on wartime lighting, Westinghouse Lamp Division, Bloomfield, N. J., has issued a 175-page "LIGHTING HANDBOOK", originally scheduled for release after the war. Designed as a practical guide and working reference book for lighting engineers, designers, architects and builders, the book on lighting was prepared by the Company's Illuminating Engineering Department.

A feature of the handbook is a series of charts which coordinate room index, fixture efficiency and coefficient of utilization curves and provide a new and graphic method of determining the desired illumination for various applications. Charts cover industrial and commercial fluorescent and incandescent lighting and provide a means of calculating quickly the number and size of lamps needed with practically every type of lighting fixture.

Faster PUNCH-TO-DIE ALIGNMENT



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You'll never need a pry-bar or hammer to separate punches from dies if you use this unique die-set machine. Positive, sensitive alignment is assured the die-maker, who can now complete the die-set right at his bench. Result: saving in toolroom time and improvement in the finished die.

Of sturdy, open construction, it can be operated with one hand under full manual and visual control. With the die-shoe clamped to the table and the punch-holder fixed in position in the ram, the punch can be removed as often as needed without disturbing alignment. Rugged for fitting up heavy die-sets, it is also useful for shearing in certain types of punches.

Ask today for full details.

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MOORE SPECIAL TOOL CO., INC.
740 Union Ave., Bridgeport 7, Conn.

(CONTINUED FROM PAGE 143)

The book is divided into two parts, chapter headings in the first section including: Lighting Terms and Measurements, Recommended Levels of Illumination, Interior Lighting Design Calculations, Interior wiring for lighting. In the second half of the book, devoted to specific lighting applications, there are chapters covering store, office, school, public buildings, industrial, architectural, aviation and street and highway lighting.

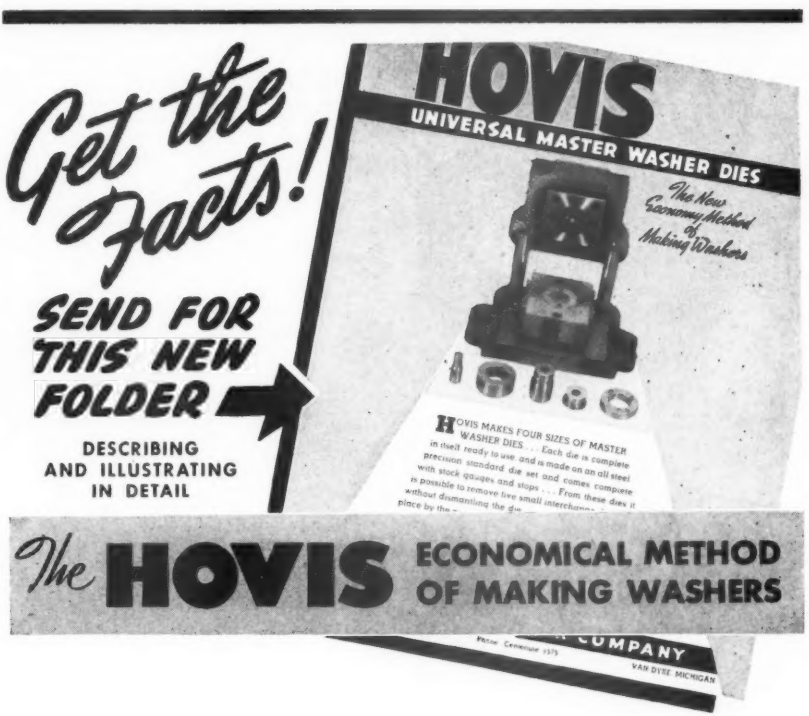
Advance copies of the "LIGHTING HANDBOOK" have been tested in the field and Westinghouse has received orders for it from schools and colleges who plan to use the manual as a textbook in illumination courses. Only a limited number of copies will be printed and the book will sell for $1.00 a copy. It is on sale in Westinghouse district offices and will be offered by coupon in advertisements in the building, architectural and lighting publications. The "LIGHTING HANDBOOK" is case-bound with a leatherette cover.

HAND TOOLS by Albert M. Wagener, M. E., Instructor in Shop Theory, Henry Ford Trade School, Dearborn, Michigan, and Harlan R. Arthur, B. S., Supervisor of Instruction for Naval Training School, Dearborn, Michigan. This extremely well-illustrated handbook on use and operation of small tools should be very valuable to the beginning shop worker. The subject matter is presented in groupings according to type, covering such classes as "Rules and Scales", "Dividers and Calipers", on through "Micrometers", "Turning and Gripping Tools" and numerous other classifications which cover the commonly-used small tools.

Each tool described is illustrated and its proper method of usage explained to some extent. The book does not set out to train workers in the detailed use of each tool, but merely to familiarize them with the appearance, name, and general usage of the commonly-used small tools. However, common practices which are dangerous to both the tool and its user are mentioned, and proper usages of each tool, as well as safety precautions, are stressed. This aspect of the book should be valuable to the experienced machine-shop worker as well as the beginner.

A chapter on "Specialized Precision Tools" is included, in order to give the beginner a "nodding acquaintance" with tools which he may find in the shop environment, but which are more intricate than he will immediately use. In short, this book is an excellent introduction to the kinds of small tools in common industrial use, and should give the beginning shop worker a better understanding of both the tools he uses and those he sees about him in the shop. It should be valuable to those who train beginning shop workers. HAND TOOLS is published by D. Van Nos-

(TO PAGE 146 PLEASE)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The New Economy Method of Making Washers
HOVIS MAKES FOUR SIZES OF MASTER WASHER DIES . . . Each die is complete in itself ready to use and is made on an all steel precision standard die set and comes complete with stock gauges and stops . . . From these dies it is possible to remove five small interchangeable
The HOVIS ECONOMICAL METHOD OF MAKING WASHERS
COMPANY
VAN DYKE MICHIGAN

LEARN all about this sensational new way of making washers that is now so widely adopted among the big industrial firms of America. No longer is it necessary to go to the expense of making a complete compound die for each new washer. Use the Hovis advanced method, consisting of a die complete in itself, ready to use, made on an all-steel precision standard die set which comes complete with gauges and stops. From these dies you can remove five small interchangeable parts without dismantling the die. Once your initial investment is made in Master Washer Dies of the sizes to fit your needs, FIVE SMALL INTERCHANGEABLE PARTS ARE ALL THAT IS NECESSARY TO BUY TO MAKE ANY SIZE WASHER. This simple method means a big saving in materials and labor.

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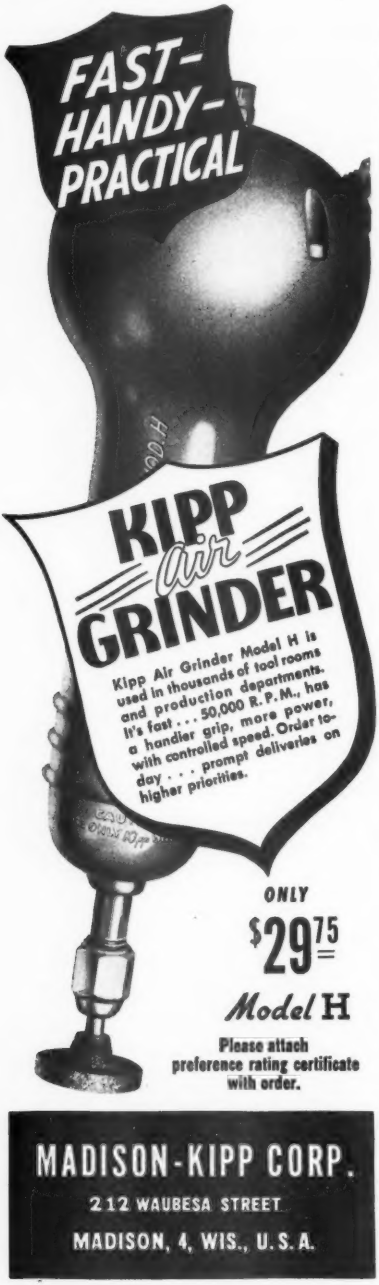
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(CONTINUED FROM PAGE 144)

trand Company, Inc., 250 Fourth Avenue New York, N. Y. Cloth binding $1.75.

SCREW MACHINE INSTRUCTION. A manual for On-the-Job Instruction of Screw Machine Personnel has been published by The National Screw Machine Products Association in the belief that it will give companies operating screw machines a better way to instruct green hands in most of the phases of multiple spindle operation. "On-the-Job" instruction by lead men, foremen, or Class "A" operators is the best practical way to learn but, in the past, its drawback has been the often-omitted point that might "make or break" the job, machine or tool. Even the best instructors can forget important items or may credit the learner with greater aptitude and basic mechanical knowledge than he has. The Association's special committee, chosen from industry to tackle this problem, has worked out its solution by using an operational or "part-by-part" approach rather than the usual method of individual "job instruction." This results in a guide directed primarily to instructors for point-by-point teaching.

The manual includes, in addition to functional machine operation, information on tooling, and trouble charts. The most common operations on machines in most general use have been covered. In some breakdowns, such as grinding taps and chasers, the combination of the different makes and kinds of taps, chasers, grinding machines and fixtures made it necessary for the committee to confine itself to general practices only. This is a guide to those wishing to formulate their own breakdowns on special practices or conditions. Blank pages are located at the end of the manual for this purpose.

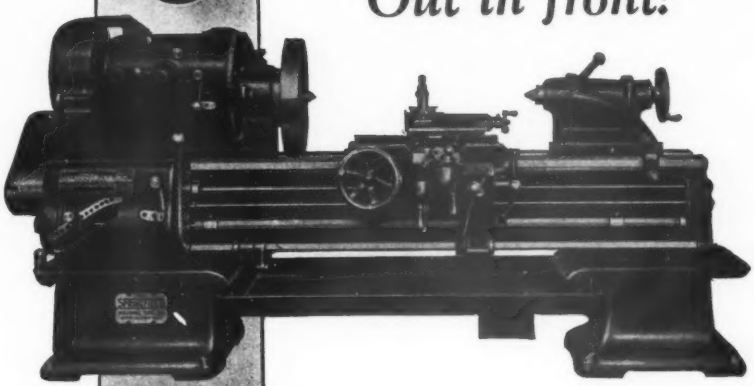
It is a 107-page book, printed on coated stock with oil resistant cover and plastic ring bound. The cost is $2.00 per copy and can be obtained by writing to the National Screw Machine Products Association, 13210 Shaker Square, Cleveland 20, Ohio.

EXPERIMENTAL ELECTRONICS by Ralph H. Muller, Professor of Chemistry, New York University, R. L. Garman, Assistant Professor of Chemistry, New York University, and M. E. Droz, Assistant Professor of Chemistry, New York University. This book has been written to supply definite practical information on the characteristics and non-communication applications of electron tubes and in your reviewer's humble opinion it is most outstanding in many respects. Altho Prentice-Hall, Inc. is not the most prolific publisher of texts on the physical sciences they seem to have the happy faculty of "ringing the bell" in the selection, quality, style and authenticity of their offerings. Their "Procedures In Experimental Physics" by John Strong of Cal. Tech. amply bears out this opinion. It is the only

(TO PAGE 148 PLEASE)

SPRINGFIELD PRECISION LATHE

Out in front!



● Headstock . . . twelve speeds . . . only half of the easy-shifting spur gears mesh at one time.

Motors . . . V-Belt or silent chain drive. Bed . . . permanently true—made of high test alloy to resist warp or marring under severe service.

Apron . . . extra heavy—operates on Ball and Bronze bearings throughout.

Taper attachment . . . hair-trigger adjustment.

Compound rest . . . sturdy, firm.

Tailstock . . . all bearings and bed ways oiled from one well.

From headstock to tailstock—the SPRINGFIELD Lathe is *out in front!*

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Tells the why and how of Springfield's accurate production.

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for the
PRODUCTION BATTLEFRONT

Speed Up Victory with "Oliver"

The tool behind the tool that does the job will help to speed up your production. 100% efficiency can be obtained only with tools that are well sharpened and kept in perfect condition. Speed up production by faster sawing and filing operations with Oliver Die Making Machines. They save 50% to 60% of the labor over hand methods in the cost of making precision Dies, Gages, Cams, Templates and similar products requiring rapid and accurate sawing, filing and lapping operations. It will pay you to investigate the line of Oliver Die Making Machines!

Send for descriptive literature today!

OLIVER INSTRUMENT COMPANY
1436 Maumee St., E. -:- Adrian, Mich.

(CONTINUED FROM PAGE 146)

book of its type published in this country and contains a wealth of heretofore unpublished and hard-to-find-elsewhere information for the experimental worker.

EXPERIMENTAL ELECTRONICS is a book that should be welcomed by any manufacturing or research personnel who are becoming electronics conscious in their post-war thinking. The authors have employed the experimental approach to their subject because of their observation that familiarity with electronic circuits is not to be gained by extensive reading alone. The value of this style of presentation has been so thoroughly proven for the undergraduate student that it should be particularly welcome and effective in the industrial field. Sufficient explanation of the theory and underlying principles has been included to clarify each experiment and the review of some very elementary principles in the earlier chapters will be welcomed by those readers who may have forgotten these fundamentals, or who may be encountering them for the first time. The text is an outgrowth of the authors' experience in courses given for several years at New York University to students and industrial and academic research workers in chemistry, biology and engineering. In these courses, students of widely different backgrounds and interests have found competence in handling electronic circuits most stimulating and helpful, revealing to them many unsuspected applications in their own fields. This should apply equally to the industrial worker and post-war planner. The radio engineer or communications expert may gain from the experiments a point of view or statement (and solution) of problems, rarely encountered in his own specialty, which are peculiar to the requirements of other fields of science and endeavor.

Published by Prentice-Hall, Inc., 70 Fifth Ave., N. Y. C., and priced at $4.65.

BARNES SAW PRODUCTION CALCULATOR. A handy, pocket size, calculator of the popular slide rule type for determining approximate hack saw cutting time has been devised by the W. O. Barnes Co., Inc., Dept. J, 1297 Terminal Ave., Detroit, Mich.

Based on a scale of machinability factors for a great variety of ferrous and non-ferrous metals the appropriate setting of the slide gives the time in minutes required for the cutting operation. The "capacity" of the calculator not only includes bar squares and rounds up to 18", but instructions are given for calculating cutting time in multiple, or nests of stock.

It is emphasized that forcing the cutting time to less than that recommended by the calculator may result in crooked cutting, short blade life and higher maintenance costs. **203-H**

(TO PAGE 150—PLEASE)

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STOP DUST

from ALL

Abrasive Operations

Entirely Self-contained. Motor, fan, cyclone separator and filter. Fast installation. Flexible metal hose permits installation complete in minutes.

Compact and Portable. Even the biggest DUSTKOPS will usually fit in the existing space behind or beside the grinder.

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MODEL 950
has a cyclone separator.

↑ *"READY TO GO" this model is for medium duty work of all kinds.*

MODEL 600
has a spun glass filter.

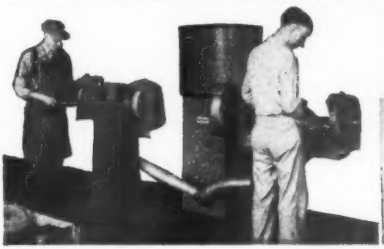
↑ *Ideal for light duty production surface grinding.*

MODEL 600
Spun Glass Filter

↑ *For smallest grinders, laboratory work.*

MODEL 1250
has a cyclone separator.

↑ *Handles all the dust from this armor grinding job easily.*



↞ *Four wheels exhaust into a single Model 1250 that gets all the dust.*

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No. 4 Motor Driven MILLING MACHINE Mounted on Cabinet Column

Burke motor driven milling machines Nos. 1, 2, 3, and 4 are specially suited for handling small, difficult work on a production basis.

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Burke Machine Tool Co.

301 E. 16th St. -:- Conneaut, Ohio

(CONTINUED FROM PAGE 148)

DIESEL LOCOMOTIVES by John Draney, Past President, United Associations of Railroad Veterans.

This is a "how-to-do-it" book on the operation and maintenance of railway Diesel locomotives. The author is a man who has had years of experience and training. He is in charge of the Diesel Question and Answer Department, Brotherhood of Locomotive Firemen and Enginemen's Magazine. He was ably assisted in the writing of this new book by several men who are associated with railroads and Diesel locomotive manufacturing concerns.

The book is clearly written, contains 472 pages, 220 illustrations, is thoroughly indexed and is ideal for anyone at all interested in the subject.

Published by The American Technical Society, Drexel Ave. at 58th St., Chicago 37, Ill., and priced at $4.00.

THE PHYSICS OF METALS by Frederick Seitz, Professor of Physics and Department Head, Carnegie Institute of Technology. This book has arisen out of a lecture course of the same title given first at the University of Pennsylvania and then at the Carnegie Institute of Technology. Designed for metallurgists with a limited knowledge of physics and for physicists with a limited knowledge of metallurgy, the lectures were intentionally made both nonmathematical and elementary, and this feature has been most successfully incorporated into the book.

A few representative chapter titles can best indicate the value of the physicist's treatment of metals to the practical metallurgist: Atomic Arrangements in Metals; Substitutional and Interstitial Alloys; The Physical Form of Alloys; The Elastic Properties of Crystals; The Plastic Properties of Alloys; Internal Friction; Rupture and Fatigue; Diffusion in Metals; The Properties of Iron-Carbon Alloys; The Cohesion of Solids; The Magnetic Properties of Metals; The Electrical Conductivity of Metals.

Published by The McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York, N. Y., and priced at $4.00.

HOW TO TEACH SHOP WORK in Vocational Schools for War Production Industries by P. T. McHenry, State Teacher Trainer, Trade and Industrial Division, West Virginia State Department of Education. This manual serves as a basis for group or individual study in preparation for the teaching of men for war production industries. The ideas, suggestions and methods that are clearly outlined have been selected from a great many sources and the material will be most helpful to those undertaking such a course of study.

Published by McKnight & McKnight, Bloomington, Ill., and priced at 25¢.

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Immediate Shipment; stock sizes #4 to 1½", 2, 3, 4 flutes; 30 day free trial.

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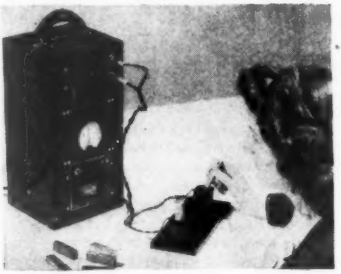
The WALTON Company
94 ALLYN STREET · HARTFORD, CONN.

New Magnetic Comparator

A NEW magnetic comparator for controlling the quality of ferrous parts of the same size and shape has been announced. When the part to be tested is placed in a coil which has been balanced electrically against a standard part, the new comparator detects any difference in the two parts which changes the magnetic flux linking the coils surrounding them. Differences may be caused by wrong composition, improper heat treatment, hardness, size, or other properties which affect the mag-



netic flux within the coil. The difference is shown as unbalance on the comparator's indicating instrument which reads within passing limits when the tested part is acceptable.

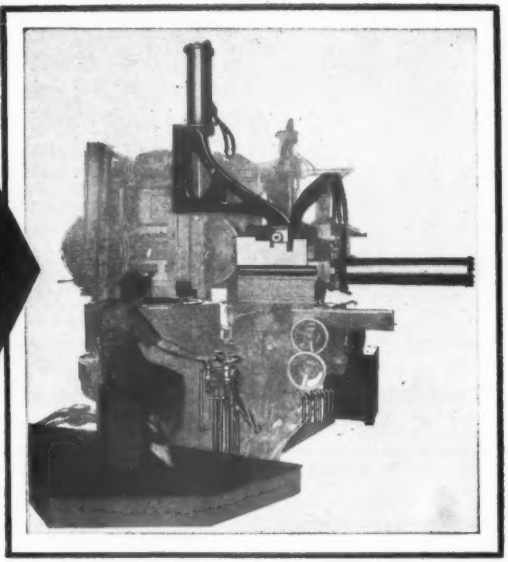
The comparator is sufficiently sensitive to distinguish between steels whose hardness varies as little as two points Rockwell when hardness difference is the sole variable. It is particularly designed for the fabricator of iron or steel parts who desires a nondestructive test to make certain that each part has the required properties within the limits of a standard part.

The comparator consists of a variable-voltage transformer, a sensitivity control rheostat, coarse and fine balance control rheostats, and the required capacitors. The zero-center indicating instrument, control knobs, and the necessary switches are located on the front panel.

The test fixtures furnished with the magnetic comparator are two air-core coils; but where surface conditions permit and the parts are too large for suitable coils, two gage heads can be furnished for contact measurements.

Write Special Products Div., General Elec. Co., Schenectady, N. Y. 77-H

THE HAND THAT ROCKS THE CRADLE CAN ALSO SINK THESE DIES



Turchan Followers attach easily to any standard lathe, planer, shaper, grinder or mill.

TIME was when die sinking demanded extreme skill and only experts were permitted to tackle the job. Today, however, ingenious mechanical devices such as the Turchan Follower have decreased the possibility of human error and lessened the necessity for such rare skill.

Take, for example, the sinking of drop forge dies — dies of almost every conceivable contour, designed to take a merciless pounding. That used to be a man's job. But today, thanks to Turchan Followers, the hand that rocks the cradle can sink such dies. And do it well!

The accompanying photograph shows a woman in a large forge plant operating a Turchan-equipped vertical turret lathe. She's sinking a die for drop forging an airplane engine part. Notice the easy, all-hydraulic, single valve control. Notice the cutting tool following every movement of the tracer mechanism. Above all, observe that the Turchan is merely an attachment — a relatively inexpensive attachment — to the die sinking machine.

The owners of this machine *Turned to Turchan* for faster, better, more inexpensive die sinking. Why don't you *Turn to Turchan?* Inquire today.

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Originators of Hydraulic Duplicating Attachments

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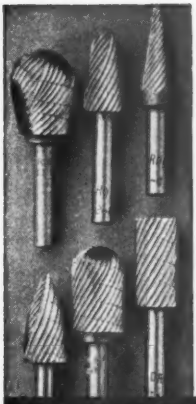

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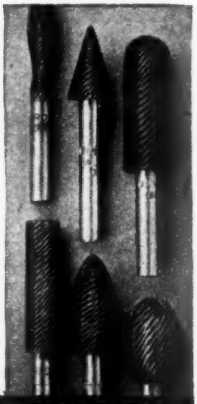

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SAVE TIME

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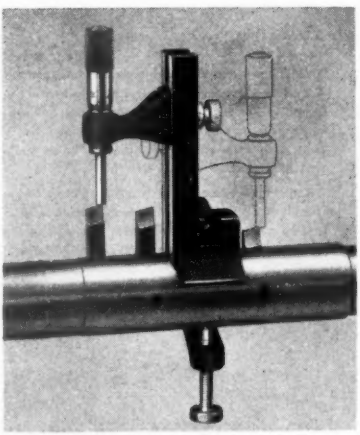
USE THE BARTELT PEDESTAL MICROMETER

Time wasted in conventional cut-and-try methods can be eliminated. Inexperienced operators learn to do satisfactory work more quickly. Three models available—Model B, with two-slide pedestal, shown.

USEFUL FOR MANY OTHER JOBS

Bartelt Pedestal Micrometers are also excellent for height and depth gaging, for inspection work of various kinds, and for other set-up operations. Write for circular giving full information.



BARTELT
ENGINEERING COMPANY
1212-B Partridge Avenue
BELOIT • WISCONSIN

C-F POSITIONERS

Safety, Economy, Speed PLUS Better Welding

A weldment can be no stronger than its weakest weld—and "down-hand" welding is your best assurance of strong flawless welds. That's why "positioned welded" is so frequently specified today!

C-F Positioners eliminate crews with slings and chains, clear your floor space, reduce accidents and **make every weld a faster, better weld!** The 135° **beyond horizontal** tilting feature of C-F Positioners combined with 360° table turn **assures** the proper welding position in even the most inaccessible corners!

Adaptable too! Heat treating, cutting, large pipe and boiler-handling problems and jobs where a continuous turn is necessary, are easily answered with a C-F Positioner. **You'll find new uses!** Many sizes and true-rated capacities. Hand or power operated. Write for catalog showing sizes, installations and many uses.

Write for Bulletin WP 22

CULLEN-FRIESTEDT CO.

1316 S. Kilbourn Ave. Chicago 23, U. S. A.

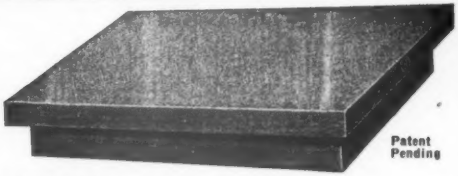
Why . . .

HERMAN

Precision Granite

SURFACE PLATES

Offer Advantages Unsurpassed



Patent Pending

Remember, these revolutionary Surface Plates are cut from solid blocks of natural granite, the ideal material for the exacting requirements of perfect surface plates. And here's why: First, HERMAN SURFACE PLATES are *flat* . . . accurate up to 1/10,000 inch overall. Then, they *stay* flat. No warping! Not affected by ordinary temperature changes! And no other plates can approach these PRECISION GRANITE Surface Plates in hardness . . . outwearing metal plates many times over. Smooth action, too! And non-abrasive, non-magnetic, non-corrosive!

Here's the greatest forward step in Surface Plate development in the past half century. Why not have all its benefits? Write or wire for descriptive circular!

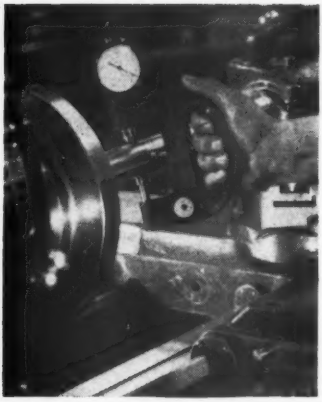
HERE ARE A FEW:

- **Flat, warp-proof**
- **Hard, precision surface**
- **Unapproached accuracy**
- **Amazingly long life**
- **Non-essential material**

Write for ALL the Facts!

THE HERMAN STONE CO.

1243 Leonhard Street, Dayton 4, Ohio



Dial Indicator Snap Gages

THE improved line of dial indicator adjustable snap gages made by the Sheffield Corporation, fills a gap between the conventional snap gage and the high precision visual gage. They are available in twelve models, covering a range of zero to 12".

One of the most important applications of dial indicator snap gages is that of checking work as it is brought down to size. As portable as a conventional snap gage, a comparator type of check can be made without removing the work from the machine. This saves many man hours on production runs and effects quality dimensional control during machining, grinding and lapping operations. It may be used for inspecting a finished part at the bench and for inspecting parts of such size, weight or location as cannot be checked with other types of comparators.

The Sheffield dial indicator snap gage incorporates a large, shock-proof dial indicator 2¼" in diameter, graduated in tenths (.0001"). The dial is calibrated plus and minus .005", and the range per revolution of the hand is .010". When properly set, the hand will make 1¼" revolution in either direction, the total range of the indicator being .025". The anvils are ground and lapped to a close tolerance and the movable anvil operates independently of the indicator spindle and with a constant spring pressure thus further assuring the accuracy of the gage. The anvil bearing is

(TO P. 188—PLEASE)

STRENES METAL IN FRONT LINE OF SERVICE

BEFORE THE WAR

Strenes can be cast to shape. Most of the usual machining time is saved. Redressing is reduced. That is why before the war Strenes gained heavily as a forming and drawing die metal. In one case around 2,000,000 stampings were obtained and the die is still in good condition ready to resume operation at the end of the war. Runs of 100,000 pieces up are not uncommon. Hundreds of the largest plants in the country used it regularly in their tooling programs. Want the names of pre-war users of Strenes?

IN THE WAR

Strenes today is being used for draw pots, draw pot inserts, draw rings for draw bench operation, for progressive upsetting dies . . . all in shell manufacture. Glad to identify all such users and many others.

AFTER THE WAR

After the war, refrigerator, stove, metal casket, grave vault, farm implement and other manufacturers will resume with Strenes metal forming and drawing dies. Many of the automobile, truck and tractor builders are extensive users, for body, fender and hood dies. Will name them to interested inquirer .

Look into the merits of Strenes metal . . . Try it, at least once.

The Advance Foundry Company
DAYTON 3, OHIO

Determine Surface Flatness to Millionths of an inch with

★ Deviations from absolute flatness can be quickly and easily determined in millionths with the aid of Acme Optical Flats and Monochromatic Lamp.

ACME OPTICAL FLATS

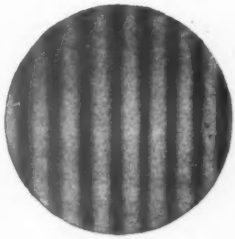


Illustration shows interference bands reflected from a truly flat surface as they are seen through an Acme Optical Flat. The straightness of the bands determines the flatness of the surface.

Our new booklet, "Shop Measurements to One Millionth of an Inch", describes in simple detail how light waves are used to measure in micro-inches.

Write for a copy today . . . it's yours for the asking.

ACME INDUSTRIAL COMPANY

Makers of Standardized Jig and Fixture Bushings

296 N. Laflin St. Chicago, Ill. MONroe 4122

In War, as in Peace . . .

CERRO ALLOYS

SAVE TIME and CUT COSTS!

CERROMATRIX (Melting Temp. 250° F.) For securing punch and die parts, anchoring machine parts without expensive drive fits, short run forming dies and other metal-working applications.

CERROBEND (Melting Temp. 158° F.) Used as a filler in bending thin-walled tubing to small radii. Easily removed in boiling water. Also used for aircraft assembly jigs, templates for forming dies and other purposes.

CERROSAFE (Melting Temp. 190° F.) Used to accurately proof-cast cavities such as molds, gun chambers, forging dies, etc. and for many similar applications.

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Accurate A-PE-CO photo-copies are made direct of anything on paper, cloth or film, written, printed, drawn or photographed, or bound in books. A-PE-CO "photo-exact" copies are so useful, so easily and quickly made, that the versatile A-PE-CO Photo-Copyer is a modern necessity in thousands of shops and offices. A valuable aid in postwar planning.

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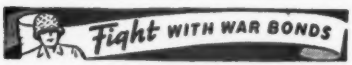
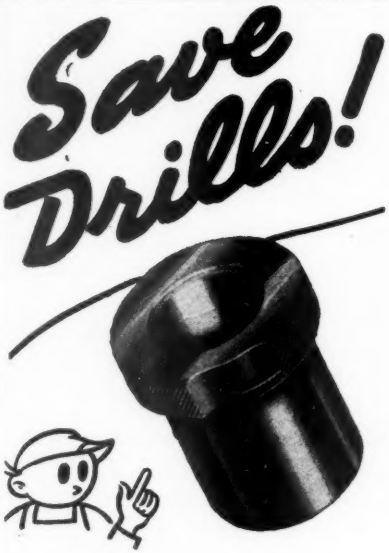
This modern, versatile method assures accuracy in every department. Make sure your copies are "A-PE-CO-perfect". Immediate delivery. Write for A-PE-CO folder, today!

AMERICAN PHOTOCOPY EQUIPMENT CO.
2849 N. Clark St., Dept. AA-24, Chicago 14, Ill.
Representatives in principal cities and Canada



If your Tool & Die Journal is late, please bear with us. We are working under the same handicaps that beset you. Our most experienced employees are in the Services. We are carrying on determined that the T&D J shall not suffer in quality of make-up or content.



Because they are straight and round and because of their super-finished bores, Universal Drill Bushings last longer —save wear and tear on valuable drills.

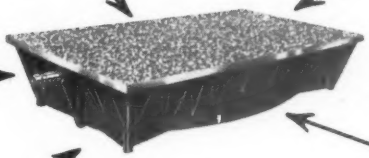
For accuracy and longer tool life it will pay you to use Universal Drill Bushings. Write for facts.

UNIVERSAL ENGINEERING
FRANKENMUTH,
MICHIGAN

ACCURACY OBTAINED BY THE SUPERIOR SMITH PROCESS:

SMITH *Master* SURFACE PLATES

INHERENT LONG LIFE!



GUARANTEED PRECISION!

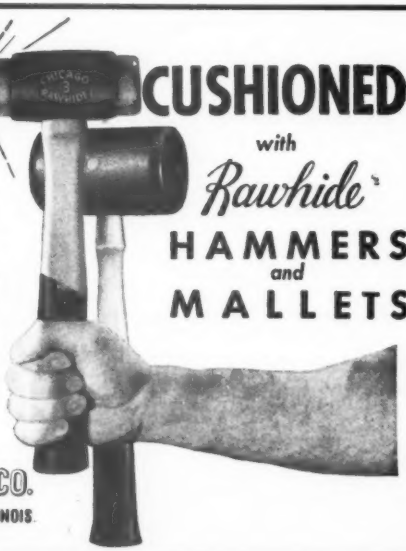
CHOICE OF DISCRIMINATING USERS!

WRITE, WIRE or PHONE

SMITH TOOL & ENGINEERING CO.

858 SANDUSKY AVE., BUCYRUS, OHIO

BLOWS CUSHIONED *with* *Rawhide* HAMMERS *and* MALLETS



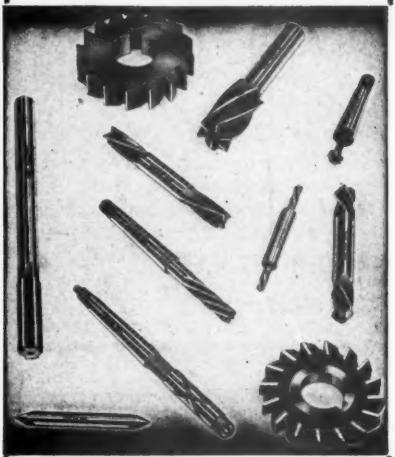
Coiled Rawhide faces strike effective blows without marring or battering; speed up work; reduce spoilage. Hold true faces—strike accurately. Outlast several ordinary mallets. Reduce bounce and recoil—prevent fatigue. All sizes with light or weighted heads. Write for Catalog.

CHICAGO *Rawhide* MFG. CO.

1281 ELSTON AVE. ★ CHICAGO, ILLINOIS

IMMEDIATE DELIVERY
FROM STOCK
On Standard Sizes

GALTER
HIGH GRADE TOOLS



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PERFORMANCE
Guaranteed

Plain Milling Cutters
Side and Face Milling Cutters
Stagger Tooth Side Milling Cutters
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Slot Cutters
Taper Shank Cutters
Spiral End Mills
Counterbores
Countersinks
Reamers
Hollow Mills
Taper Shank Drills
Straight Shank Drills

PROMPT DELIVERY ON SPECIAL TOOLS, DIES, JIGS AND FIXTURES MADE TO YOUR EXACTING REQUIREMENTS

Write for prices on standard sizes or submit blueprints for quotations on special sizes.

Galter Manufacturing Co.
711 W. Lake Street - Chicago, Ill.

ASA Standards

The American Standards Association announces the recent publication of its new list of standards. There are more then 600 standards listed, of which 64 have been approved or revised since the last price list was printed (April, 1943). The standards cover specifications for materials, methods of tests, dimensions, definitions of technical terms, procedures, etc.

Since the war, the ASA has been working very closely with government agencies and with the Armed Services to provide specifications for certain of the materials necessary to our war effort. Because these standards are developed through an accelerated procedure, they are designated as American War Standards. These are listed separately and, to date, there are 40 already completed and many more under development. These war standards have been produced in the field of safety work, machine tools, quality control, photography and radio, just to mention a few. Every government order is based on specifications; standards are used to accelerate production, conserve materials, maintain a balance between quality and price control, simplify inspection, contracting and sub-contracting. All of them are designed to relieve shortages of time, material and man-power.

In each case, the standards approved by the ASA represent general agreement on the part of maker, seller, and user groups as to the best current industrial practice. More than 600 organizations are taking part in this work.

The complete list of American standards should serve as valuable reference material to engineers, manufacturers, purchasing agents, etc. It will be sent free of charge to anyone interested in this work. Requests should be addressed to the American Standards Association, 29 West 39th St., New York 18, N. Y.

★

Gear Engineering Letter Symbols

The American Standards Association has recently approved the American Standard Letter Symbols for Gear Engineering (B6. 5-1943), which it is hoped will establish a uniform practice in

(TO PAGE 164—PLEASE)

Penrod Centrifugal Coolant Pumps

Penrod Pumps Easily Applied, Give Better Service

Penrod Pumps are conventional in style but incorporate many new features such as replaceable seal assemblies, totally enclosed motors, grease sealed ball bearings and streamlined design.

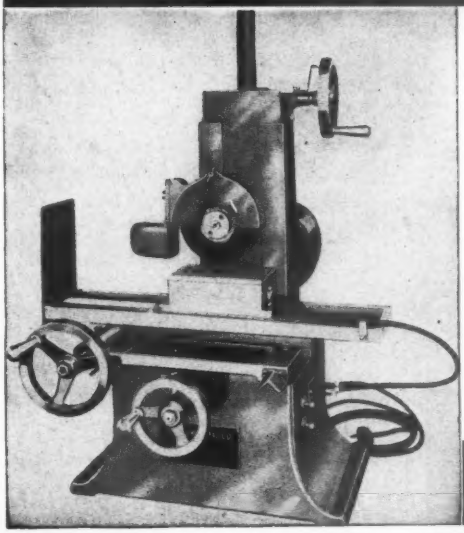
Model P-10h pump (left) uses the motor for mounting and can be located in any position as long as the liquid will flow into the pump by gravity. This pump is easily installed on old or new machines. Model P-30 V Pump (right) is for submerging into the coolant reservoir, and is especially suitable for use with coolants containing abrasives or small chips.

Tanks built especially for Model P-10-¼ and Model P-30 V-½ Pumps can be supplied promptly.

Model P-10H and Model P-30 V pumps are ready for immediate delivery. Phone or wire us for details

FLOYD PENROD & SONS
TOOL & ENGINEERING COMPANY
P. O. BOX 909 Muncie, Indiana

Sanford precision bench surface grinder



A HIGH SPEED GRINDER FOR ALL SMALL PRECISION WORK

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Write for Specifications Bulletin No. C
Dealer Inquiries Invited

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PROMPT DELIVERY

SANFORD MFG. COMPANY
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Quick Boring

Universal Mikro-lok Boring Bars are designed for finishing cuts where extreme accuracy is required. Especially adapted for boring to a shoulder, or to the bottom of a hole or where intermittent cuts are being taken. Extremely rigid. Easily and quickly adjusted like a micrometer to limits of .0005 or less. Available singly or in sets. Write for facts and prices.

UNIVERSAL ENGINEERING
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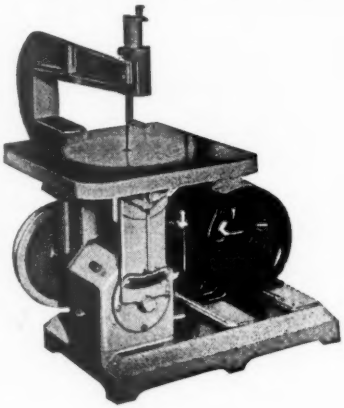

ATLAS DIE FILING MACHINES

Can be used for all kinds of die making. The overarm is constructed so that the file and saw attachments may be interchanged with little effort. The hold-down fingers are attached directly to the overarm. Working surface of the table, which tilts two directions, is entirely clear. An improved type of chuck, consisting of movable hardened jaws, holds both saws and files. Screw adjustment makes changes easy and fast.

COMPLETE WITH MOTOR—$125 NET
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ATLAS EQUIPMENT COMPANY
3179 N. CLARK ST., CHICAGO 14, ILL.

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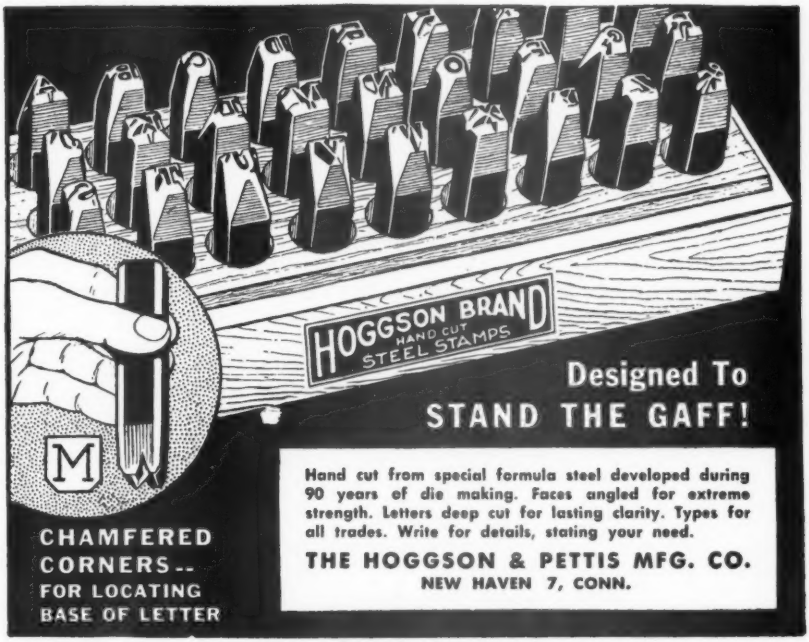


Designed To
STAND THE GAFF!

CHAMFERED CORNERS -- FOR LOCATING BASE OF LETTER

Hand cut from special formula steel developed during 90 years of die making. Faces angled for extreme strength. Letters deep cut for lasting clarity. Types for all trades. Write for details, stating your need.

THE HOGGSON & PETTIS MFG. CO.
NEW HAVEN 7, CONN.

NEW! Hammond

10" and 14"
WET TOOL
GRINDERS
FOR
CARBIDE TOOLS
and HI SPEED, Tool

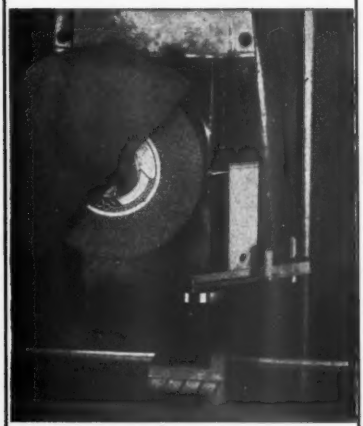
Grinding wet, helps prevent tool tip crazing and flaking, and eliminates heat cracks.

New features of the Hammond 10 and 14: No Spray-No Splash concealed wheel guards provide greater operator freedom and complete visibility of work; Adjustable Coolant spouts swivel in and out with flooding action of the coolant; Safety Cup disc prevents operator from accidental dropping of tool into cup of cup wheel.

SEND FOR BULLETIN NO. 206

Hammond Machinery Builders INC.
KALAMAZOO 54, MICHIGAN
1631 DOUGLAS AVENUE
Eastern Branch—71 W. 23rd St., New York 10, N. Y.

The FORM-MASTER
ANGLE AND RADIUS DRESSER



An all-purpose angle and radius dresser for high-precision at low cost. Accurate easily within .001". Simple to operate. Dresses in horizontal position enabling operator to SEE the form in work. All parts hardened and ground (except cast-iron base which can be drilled and tapped). Suitable for surface and cylindrical grinders. Two 1/3 ct. quality diamonds and instrument case included . . . $150.00.

It readily produces: Any desired angle; Convex radii to 4"; Concave Radii to 7". On 7" wheel.

Specifications: Base 3"x3", height 8½"; Wheel capacity 8"; Angular travel 3".

For information or a demonstration CALL YOUR SUPPLIER.

MANUFACTURED BY
J & S TOOL CO. 477 Main St., East Orange, N. J.
PRECISION DRESSING TOOLS

(CONTINUED FROM PAGE 160)

mathematical notation for equations and formulas dealing with toothed gearing. The symbols included in this standard cover those used in connection with design, application, manufacture, inspection, and new methods and problems in this field. The purpose of the work is to facilitate a clear understanding of mathematical work in published articles, papers and books, and to eliminate possibilities of confusion. It is not intended that these letter symbols be used on working drawings or in manufacturing records.

The standard presents the general principles of letter symbol standardization, dealing with symbols and subscripts. Four lists are given: (1) the allocation of the English alphabet for gear engineering symbols; (2) Greek letters employed in the standard; (3) recommended plan for subscripts; and (4) letter symbols for gear engineering, divided into general and special symbols.

The standard was developed under the technical leadership of the American Society of Mechanical Engineers and the American Gear Manufacturers Association and should prove valuable to anyone having the occasion to work with gear engineering or gear manufacturing. This American Standard, Letter Symbols for Gear Engineering, was developed by a subcommittee of the ASA Committee on the Standardization of Gears.

The American Standard, Letter Symbols for Gear Engineering, may be obtained for 29 cents from the American Standards Association, 29 West 39th St., New York 18, N. Y.

★

Revised Standards Cover Forming Tool Blanks, Machine Tapers

The American Standards Association has announced the revision of two in the series of 20 machine tool standards, B5.7-1943, Circular and Dovetailed Forming Tool Blanks, and B5.10-1943, Machine Tapers (Self-Holding and Steep Taper Series).

The standard covering circular and dovetail tool blanks and their holders was approved first in 1936, necessitated by the need for interchangeability of circular and dovetail tools, manufac-

(TO PAGE 168—PLEASE)

TWO MACHINES IN ONE FOR DIE FILING

Use Top Table as Shown

FOR PUNCH AND BLIND HOLE FILING

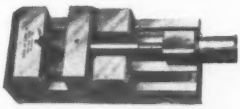
Tilt top table back. Use lower table

ADJUSTABLE STROKE 0" to 1½"

ADJUSTABLE SAFETY FRICTION DRIVE

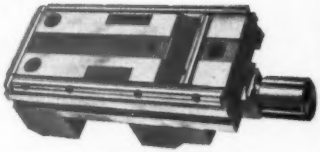
PRECISION

ANGLEMASTER SINE VISES



No. 2 TILTS ONE WAY SAME AS SINE BAR

No. 3 TILTS THREE WAYS



HARDENED, GROUND, LAPPED

Features Include:

1. Precision Sine Rolls
2. Non-Projecting, fully covered, Telescoping Screw
3. Removable Grip Screw Knob
4. Prismatic Slide Jaw
5. Accurate Integral V-Block
6. Tolerance .0002"

WRITE FOR CIRCULARS

IDEAL TOOL and DIE CO., INC. - 735 CONGRESS STREET SCHENECTADY, N. Y.

HILL-CLARKE

Modernized

CYLINDRICAL GRINDERS

for **SUPER-GRINDING** *and* **MICRO-FINISH**

Hill-Clarke Modernized and Motorized Cylindrical Grinders offer refinements in design which minimize vibration and assure extreme accuracy on all grinding operations. One of these refinements, the Hill-Clarke Patented Multiple V-Belt Drive to work spindle, contributes to the smoothness in operation which makes possible a finish within a few micro-inches even when using standard grain free-cutting wheels. Investigate today by sending for a copy of the Hill-Clarke catalog "Super Grinding."

SIZES AVAILABLE

10x28	10x50	14x50	16x72
10x36	10x72	14x72	18x96

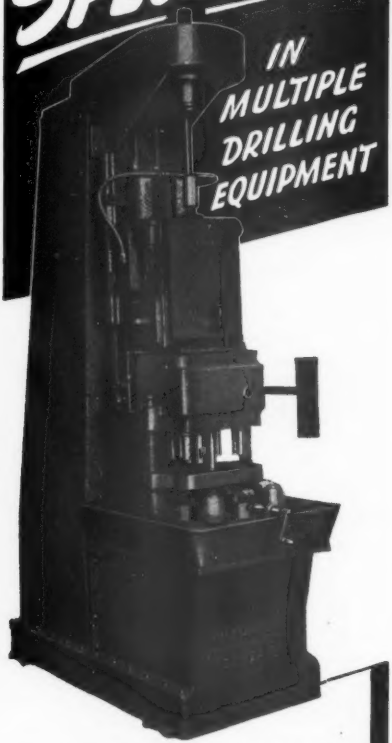
18 x 168

HILL-CLARKE MACHINERY CO.

646 WASHINGTON BOULEVARD CHICAGO 6, ILL.

SPECIALISTS

IN MULTIPLE DRILLING EQUIPMENT



Our Complete Facilities and Long Experience in Making Multiple Drilling Equipment for

DRILLING . . . REAMING . . . SPOT FACING . . . COUNTERBORING . . . TAPPING, Etc.

especially qualify us to take care of your individual requirements. Our Engineering Department gladly offer their services. Write us, giving details.

Pictured Above

is a special Hydraulic Drilling Machine; 8-spindle Drill Head Bushing Plate and Indexing Fixture.

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971 E. 8 MILE ROAD HAZEL PARK, MICH.

When days mean **VICTORY** *call for*

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One Week Delivery

No Need to Wait for Furnaces
ORDER JOHNSON

No. 120 Hi-Speed Steel Heat-Treating Furnace

Reaches 1500° F in Just 5 Minutes

The handiest furnace in your shop! Not only can it heat-treat hi-speed steels, but is also just right for hardening punches, dies and tools. Equipped with G.E. motor and Johnson blower. Heavily lined thruout with hi-temperature insulating refractory. Firebox is 5" high, 7¾" wide, 13½" long.

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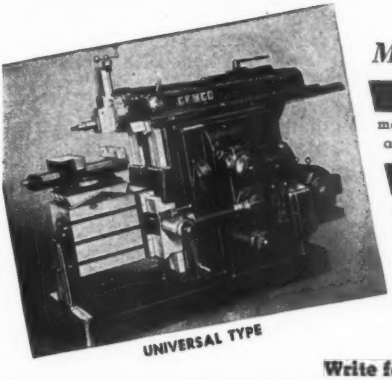

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GEMCO

***Multi-Purpose* SHAPERS**

PLAIN TYPE A fast utility machine for a wide variety of the average shop work and for training purposes in industrial schools.

PRODUCTION TYPE Massively constructed with a large table to handle medium heavy work on a peak production basis with high limits of accuracy.

UNIVERSAL TYPE Ideal for tool and die work, experimental laboratories and model shops or where angular work set-ups are required.

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Manufacturers of Precision Equipment SINCE 1917

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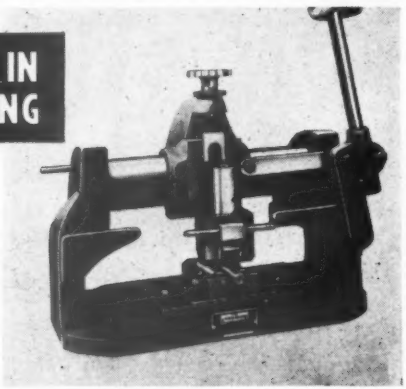
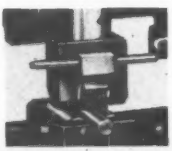
THE No. 9A MARKING MACHINE NUMBERS OR MARKS WITH EACH FORWARD AND EACH BACKWARD STROKE

Deep, clean marking or numbering of tubular and cylindrical parts and pieces is accomplished easily and efficiently with the ACROMARK machine. Minimum of adjustments and simplicity of operation permit untrained personnel to produce perfect work at all times with hand operated or motor driven machines. Write for literature describing the complete ACROMARK line of marking, stamping and numbering machines and accessories; no obligation.





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Heavy, rugged construction assures long life even when used on untempered steel and stainless steel.

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MORE CUTS PER DOLLAR
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SPECIALIZING IN HIGH SPEED CUTTING TOOLS TO YOUR PRINTS

TO HELP YOU TEACH THE NEW GRINDER HAND

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9444 Grinnell Ave., Detroit

KOEBELITE
DIAMOND TOOLS

Multi-Point, Multi-Set, Multi-Edge, and Single Set. Diamonds for All Industrial Purposes.

(CONTINUED FROM PAGE 164)

tured for use on various makes of screw machines. Since then, the Committee has decided to add standards for the holding elements. The revised standard includes, besides the sizes and types of circular and dovetailed forming tool blanks, the associated mounting portions of their respective holders for use on automatic screw machines.

The standard should provide interchangeability and reduce the number of blanks now in use. In order to do this, the machines have been classified into six different groups of comparable stock capacities. Each group will take a definite size tool and the holders are provided with suitable mounting or clamping devices.

The American Standard for Machine Tapers (B5.10-1943) was first approved in 1937, to limit the different types of tapers in use. It was decided, later, to revise the part of the standard dealing with the self-holding taper series. The standard now sets a uniform practice for the slope of self-holding and steep machine tapers, the detailed dimensions for this type of taper tool shank, and the corresponding dimensions for the taper socket in the spindle of the machine, including the dimensions of the keyways.

Both of these standards have been formulated by the ASA committee B5, on Small Tools and Machine Tool Elements, and under the joint sponsorship of the American Society of Mechanical Engineers, the Society of Automotive Engineers, and the National Machine Tool Builders' Association. The Chairman of Committee B5 is W. C. Mueller of the Western Electric Co.

The American Standard for Machine Tapers is available at 60 cents a copy and the American Standard for Circular and Dovetail Forming Tool Blanks, at 50 cents a copy, from the American Standards Association, 29 West 39th St., New York 18, N. Y.

★

New Patents of Tooling Interest
(For Obtaining See Page 202)

GRINDING WHEEL TRUING MECHANISM, No. 2,332,560.
GEAR CUTTING MACHINE, No. 2,332,570.
DIE FOR PUNCH PRESSES AND THE LIKE, No. 2,332,590.
CROSS-SLIDE CONSTRUCTION FOR MACHINE TOOLS, No. 2,332,805.
QUICK-SETTING DUPLEX TOOLHOLDER, No. 2,333,021.

Yes, these screws save Time and Space!

No matter how close to a corner or flange you put Mac-it hexagon socket screws, there's plenty of room to drive them. Use this advantage to save space.

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Mac-its are heat-treated to give far greater strength than plain steel screws. With that extra holding power, you may be able to use fewer screws—save drilling and tapping time.

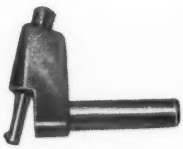
Mac-its

PRONOUNCED "MACK-IT"

4311

OTHER MAC-IT PRODUCTS INCLUDE: Socket head and hexagon head cap screws, stripper bolts, hollow and square head set screws, hexagon socket pipe plugs.

Strong, Carlisle & Hammond Company • Cleveland, Ohio



Attachment for Full Semi-Circular Radii

Only tool of its kind! Use with Golconda Rattail Diamond Tools to make full semi-circular radii as small as 0.035". Available at small extra cost.

$61.00 Radius Dresser with one 90° GOLCONE Diamond Tool

$97.50 Complete with 2 Golcones (60° and 90°) one crystal point, one roughing tool, one Semi-Circular Radii Attachment, and 3 Rattail Diamond tools (1/8", 3/32", 1/16").

MAKE-ALL RADIUS DRESSER

Simple to set up . . . easy to operate . . . the Make-All Radius Dresser requires no difficult calculations, no depth gauges, micrometer nor vernier setting. Only one moving part assures extreme accuracy. Makes Concave and Convex Radii. Send priority rating with your order for quick delivery.

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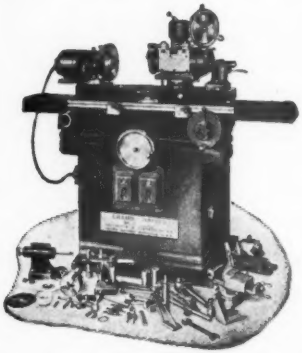

Grand Rapids No. 6 Universal Cutter & Tool Grinders feature cabinet base, ball bearing table and fixed table height, backed by 35 years of know how.

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MILLING - DRILLING - BORING ATTACHMENT *for* **Heavy Duty Operations**

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Large Quill

4″ Travel

(counter balanced, hardened and ground)

6 SPEEDS

250-3000 RPM

Lever and Worm Feeds

½ H. P. Motor

Specially engineered by RUSNOK to meet the demand for heavier duty end mill operations. Uses many types of cutters on a wide range of work. Large size spindle (No. 9 B & S taper). Takes ⅛″ to ¾″ end mills. Precision Engineered and Ruggedly Constructed Throughout.

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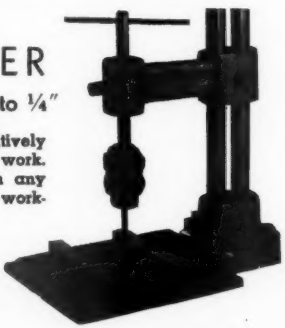
SENSITIVE HAND TAPPER

for hand tapping of delicate threads, from #0 up to ¼″

This handy device is precision-built and jig-bored and will positively eliminate expensive tap breakage or spoiled holes on costly work. The lapped spindle and guide assures perfect alignment in any position of the tap. The tapper comes complete with two work-holding jaws and special tap chuck.



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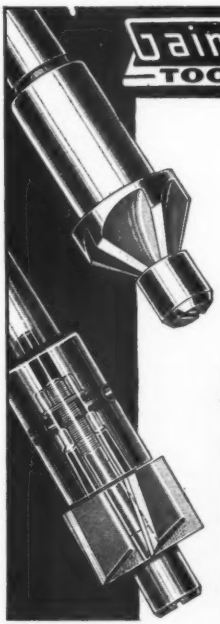
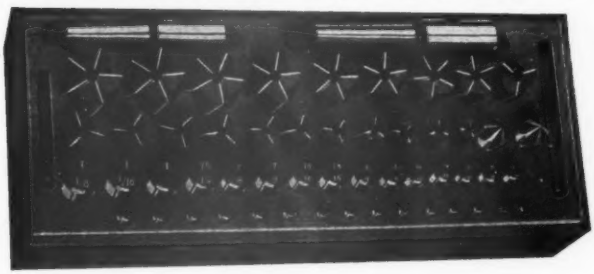


Gairing TOOLS Counterbore Sets

A kit of these efficient tools eliminates costly **delays in** counterboring and spotfacing. Seven sets from **which to** choose. Each contains a logical selection of **interchange**able counterbores, pilots and holders. ***Write for prices and Bulletin C.***

Set C-13, below, consists of 2 holders, 20 cutters ranging from $\frac{9}{16}$" to $1\frac{3}{4}$" and 28 pilots ranging from $\frac{9}{32}$" to $1\frac{1}{8}$". Two countersinks, $\frac{7}{8}$" x 70° and $\frac{7}{8}$" x 82° are included, all neatly boxed with hard wood cover.

THE GAIRING TOOL CO., Detroit, Michigan



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FEATHER TOUCH
Most Modern • Light Weight • Perfect Balance • Hollow Steel Frame • Triple Plated Chrome Finish

Prompt Delivery. Made in 89 Different Sizes and Types. 1" to 96".
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Engineered To Perfection
A New Standard of Accuracy
TUBULAR MICROMETER CO.
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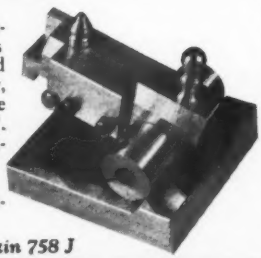
ANGLE DRESS WHEELS
within ± 10 SECONDS

Since
ANGLE WHEEL DRESSER
Dresses surface-grinder wheels easier, faster and more accurately, at any angle from 0° to 90°. A rugged precision tool for everyday shop use. Pays for itself quickly.

Write for Bulletin 758 J
FLORIAN MFG. CO.
PLANTSVILLE, CT.

1943 Arc Welding Developments

by R. F. Wyer
Welding Engineer
General Electric Co.

ONE of the outstanding developments during 1943 has been the extension and perfection of gas-shielded arc welding methods. Both argon and helium have been used successfully to provide an inert gas shield around either a tungsten or carbon arc welding electrode in the welding of magnesium alloys, in particular, and of some other alloys as well.

The arc welding of magnesium in the repair of castings has been widely extended. Army Air Corps specifications permit the use of inert gas-shielded arc welding for certain repairs on magnesium alloy castings. Indications are that this process will make a tremendous contribution to conservation and production in this field.

A large amount of developmental and experimental work has been done on the gas-shielded arc welding of wrought magnesium alloys in preparation for the apparently inevitable wide adoption of extrusions and rolled sheet in the metal working industries. Notable among the results of this developmental work are the so-called "revers-bevel" joint preparation for butt joints in thin magnesium alloy sheet, and the use of formed backing strips of thin stainless steel for the same type of joint. Both of these developments look toward the improvement of joint strength and soundness by controlling the amount of drop-through, and the dispersion of the oxide present on the plate edges.

There were two marked trends in the alternating-current arc welding field. The introduction of AWS Class E-6011 electrodes for high-quality vertical and overhead welding with alternating current was followed during 1943 by an important extension of the use of alternating-current arc welding for all-position high-quality work. Electrodes in Class E-6011 are now available in $\frac{3}{32}$", $\frac{1}{8}$", $\frac{5}{32}$", $\frac{3}{16}$" and $\frac{1}{4}$" diameters, and have characteristics comparable with those of the reverse polarity electrode so widely used for direct-current arc welding. One of the oustanding characteristics of the E-6011 electrode now in wide use is its

(TO PAGE 176—PLEASE)

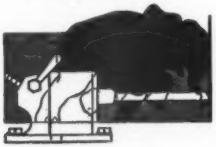
Accelerating WAR PRODUCTION

Speed your output with Criterion Diamond Tools. The kind of service they give is responsible for the swift, steady increase in their use. Quality of diamonds employed plus a unique method of setting assure extreme rigidity and extra tool life. Special tools made to order following blueprints or specifications. Sharp-pointed, selected thread grinding tools. Ask your dealer or order direct. Request free literature.

CRITERION MACHINE WORKS
BEVERLY HILLS, CALIFORNIA

MEAD Presents the
AIR PRESS

The new Mead Air Press delivers 400 lbs. pressure on 100 lbs., line pressure. Handles many staking, crimping, assembly, and similar operations. Stroke of ram adjustable from 0″ to 2″. Maximum clearance 4″. With foot control this press will speed up countless bench jobs, save muscular effort. Write for new AIR POWER Catalog — just off the press.



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250 Sizes and Shapes

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Alloy Steels For Offense

Scientifically selected to conserve critical alloys and meet the requirements of the AIRCRAFT, ORDNANCE, and MACHINE TOOL industries.

Complete "EARMARKED" stocks of Aircraft alloy steels at Buffalo and Detroit.

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Cleveland, Chicago, Newark, Detroit, Buffalo, Cincinnati

When E. K. Welles, president of Charles H. Besly & Co., 118 N. Clinton St., Chicago, Ill., accepted the Army-Navy "E" Award on behalf of his company, his twin brother, Lieutenant Commander Donald P. Welles, represented the Navy in the presentation of the "E" pins.

The company was awarded the Army-Navy "E" for maintaining a high rate of production. Even before Pearl Harbor vital production tools have been going out from the Charles H. Besly & Company plant at Beloit to points all over the globe. The Company manufactures precision grinding equipment and taps. These two lines have been in constant demand as basic war production tools.

YOU CAN STILL GET SERVICE FROM BISSETT!

We're sorry that we can't tell you the whole story . . . of all the things Bissett engineers are doing for Bissett customers these days . . . but needless to say, you can still get service from our warehouse. Call us — we may have the answer to *your* problem, too.

For Immediate Delivery

N.E. Steels and Standard S.A.E. Steels, both Carbon and Alloy, Hot Rolled and Cold Drawn • Chisel Steels • Cumberland Ground Shafts • Drill Rod • High Speed Tool Bits • Shim Steels • Tool Steels • Boiler Tubing.

BISSETT Steel
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A second gold star has been awarded the Cooper-Bessemer Corp. for the outstanding monthly production records made by their plants in Mount Vernon and Grove City, Pa., during 1943 and maintained during the closing months of the year.

The Company's Diesel engines, generating sets, engine-driven compressor units, and foundry products are playing an increasingly important part in meeting the power needs and other requirements of the Allied war machine.

STA-KOOL
TOOL HOLDER

What makes a really fine tool? Proper design and construction, of course, as well as quality of material and workmanship, plus the maker's integrity. JKS Diamond Tools are designed to meet all production problems, but it frequently happens that special conditions call for special treatment. In such cases we make a study of these conditions, preparing a JKS Diamond Tool that will stand up to the most exacting tests. You may add our experience and facilities to your organization by telephoning our nearest district office. This will bring prompt response and wholehearted coöperation.

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Grips 'em tight

For firmly gripping drills, keyway cutters and end mills, you can't beat Universal Collet Chucks. Universal Chucks don't marr tool shanks yet grip as strong as solid steel itself. The chuck shown here has National Milling Machine taper shank. Also available are Universal Standard, Floating, and Centering chucks. Write for facts.

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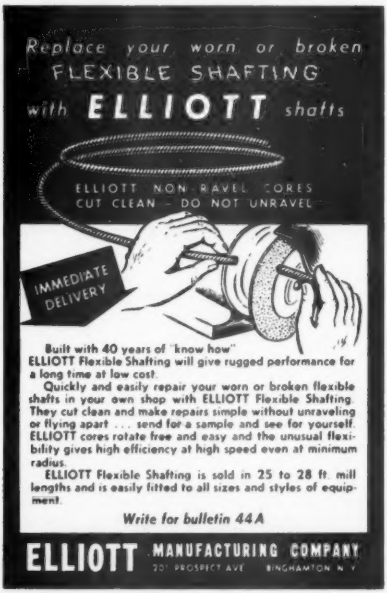
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CUT CLEAN — DO NOT UNRAVEL
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Built with 40 years of "know how" ELLIOTT Flexible Shafting will give rugged performance for a long time at low cost.
Quickly and easily repair your worn or broken flexible shafts in your own shop with ELLIOTT Flexible Shafting. They cut clean and make repairs simple without unraveling or flying apart . . . send for a sample and see for yourself. ELLIOTT cores rotate free and easy and the unusual flexibility gives high efficiency at high speed even at minimum radius.
ELLIOTT Flexible Shafting is sold in 25 to 28 ft. mill lengths and is easily fitted to all sizes and styles of equipment.
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201 PROSPECT AVE. BINGHAMTON, N. Y.

(CONTINUED FROM PAGE 172)

remarkably high elongation combined with high yield point and ultimate tensile strength.

The other trend in a-c welding has been toward the use of outdoor type welders. Completely drip proof and specially treated to resist atmospheric moisture, these units have been particularly attractive to shipyards, where the complete protection of welding equipment from the weather is often difficult.

This latter trend has been accompanied by a wide interest in idling voltage control panels—both built into outdoor welders and as separate panels—which reduce the no-load voltage of the welder to approximately 30 volts and which practically eliminates no-load losses.

Of considerable interest also is the effect of the widespread campaigns during 1942 to reduce electrode consumption. Although ratios of electrode consumption to steel fabricated in shipyards still vary widely from yard to yard, the overall trend during 1943 was noticeably downward.

As in 1942, the past year has been marked more by prodigious efforts to increase production than by the number of entirely new developments. Some developments have undoubtedly been held back by preoccupation with production problems, and these, added to the results of basic research which has gone on throughout 1943, should result in important new trends in the arc welding field in 1944.

New Welding Positioner

In the line of welding positioners recently introduced by Harnischfeger Corporation, is their model WP-2 of 2500 pound capacity. Featuring flexibility of use, simplicity, and easy operation, it is designed for production line welding as well as job work, maintenance, etc. As in senior models, the construction throughout is of all-welded rolled steel. The table diameter is 42", it has 18 handy radial slots for mounting fixtures, and is turned manually to suit welding speed. Tilting is controlled by hydraulic power with 135° beyond horizontal position attainable. Both table movements, turning and tilting, have positive locking devices. A telescopic column with self-locating stops provides for table elevation from 28-inch minimum to 60-inch

(TO PAGE 180—PLEASE)

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SHARP, ACCURATELY SCRIBED LINES

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4 Oz. Brush in Can	.40
PINT	.60
QUART	.90
GALLON	2.50

QUICK DRYING!
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CAPACITY:
3/8" to 2½" drills.
5" x 9" adjustable table.

MOTOR: ½ hp, 3450 rpm.

NET WT: 250 lbs.

CRATED: 320 lbs.

PRICE: $150.00.

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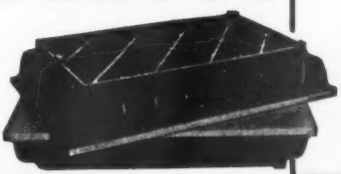

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PLANED & SCRAPED on same 3-POINT BEARING on which they will rest in use.
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AVAILABLE PLANED and SCRAPED in standard sizes 12" x 18" to 36" x 72".
THE ONLY PLATE that has a 50% trade in value when purchasing a new REID plate.
Prompt delivery on priority orders.

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The most complete catalog of its kind. Lists 5000 different shapes, sizes and cuts of GROBET Precision Swiss Files. Ask also for catalog YM on files for filing machines.

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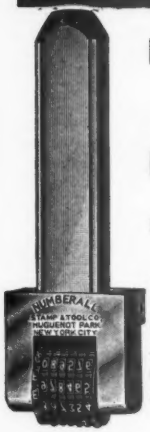

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STAMP NUMBERS, etc. Quickly—Neatly PERFECTLY ALIGNED

Can be furnished with Shank for Press and with any number of wheels from 3 to 20.

Model No. 70

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With HOLDING Fixture for Bench Grinder

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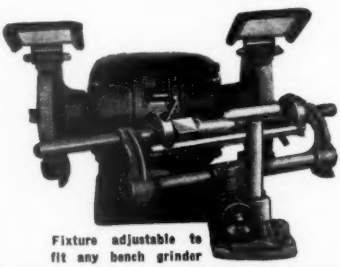

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It's a help that die makers, tool makers, machinery builders and general machinists have long sought—a more accurate and surprisingly faster way of transferring blind screw holes.

The Heimann Transfer Screw Set is a self-contained, complete tool. No wrenches or pliers are necessary. Made in ¼" to 1" diameters.

Send for price list.

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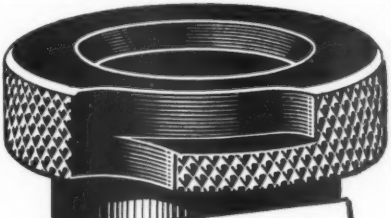

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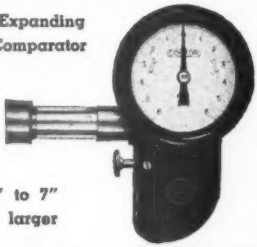
Write for Specification Sheets and Prices . . .
COLONIAL BUSHINGS, Inc.
145 Jos. Campau St., Detroit

COLONIAL
DRILL JIG BUSHINGS

Enables even trainees to gage to fractions of .0001"

COMTORPLUG

Patented Expanding Internal Comparator



Sizes: ¼" to 7" dia. and larger

In airplane, ordnance, automotive and other industries working to ten-thousandths, Comtorplug solves the problem of how to get machine operators, bench inspectors and inspector-supervisors all "talking the same language." Automatically shows size, front of back taper, out-of-round, bell mouth, barrel shape, etc.

REQUEST BULLETIN 29

THE COMTOR CO.
82 Rumford Ave. Waltham, Mass.

Up—Down and All Around

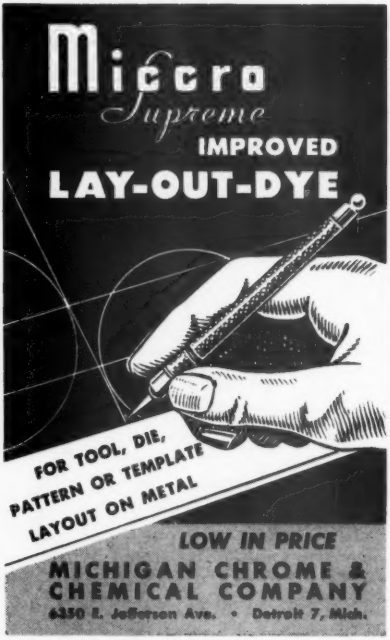
PORTELVATOR (*Portable Elevating Table*)

Why pull men away from more important work when the PORTELVATOR will handle materials, tools, parts and supplies all over your plant!

Used as overhanging table, too.

Capacity up to 20 tons.

THE HAMILTON TOOL CO.
Ninth and Hanover Streets
HAMILTON OHIO



AMC DEMAGNETIZER
A Tool Room Necessity
SWITCH
RED PILOT SIGNAL
Every tool room needs this simple, portable, sturdy demagnetizer. Small parts passed through the powerful AMC field are instantly demagnetized. Large, flat surfaces can be demagnetized by sliding the device over the surface.
Available for either 115 V. or 220 V.
Write for full information.
ALOFS MFG. CO.
1319 Madison Ave., S. E., Grand Rapids, Mich.

(CONTINUED FROM PAGE 176)

maximum from floor, depending on type of mounting. Portable or column-in-floor mountings are available.

The design is marked by sturdy and safe construction throughout. For example, the removable table is held to the platen by ten heavy bolts. Platen index is welded integrally with king pin which is held in position by large safety lock nut. No gearing is exposed. Available extra equipment includes electric power or ring gear and handwheel assembly for table turning with foot or push-button control, higher than standard columns in increments of one foot and roller equipped outboard supports for handling long or large weldments. Equipment for power table rotation, constant speed of 1 rpm may also be had, and all table assemblies are readily interchangeable in the field.

Complete specifications and literature available from manufacturer on request from the Harnischfeger Corp., Dept. T, 4531 W. National Ave., Milwaukee, Wis. 311-H

Electro Plastic Process

The new process of metal plating on plastics, glass, etc., developed by Precision Paper Tube Company* has been taken over by Electro Plastic Processes, 2035 West Charleston St., Chicago 54, Ill.

Installation of special equipment to facilitate production runs is going steadily forward. Operation on a limited basis has been in progress for several months.

Stronger unity of bond between metal and plastic is obtained by the new process. It withstands impact, vibration, and extreme temperatures without peeling or blistering, to the limits of the dielectric itself, which is greatly strengthened by the plating.

★

New Patents of Tooling Interest

(For Obtaining See Page 202)

MACHINE TOOL, No. 2,331,704.
INTERNAL THREAD GAGE, No. 2,331,757.
PROFILING AND CONTOURING TRACER, No. 2,331,817.
THREAD COMPARATOR, No. 2,331,882.
GAUGING APPARATUS, No. 2,331,987.
DRILL, No. 2,332,295.

**Tool & Die Journal, August 1943, page 192.*

Empire LIVE CENTER

WITH REPLACEABLE POINT

- ACCURACY
- VERSATILITY
- HEAVY DUTY

A. Very large, for pipe or tubing work
B. Extra long point used in facing operations
C. Extra wide point for large diameter work
D. Standard point
E. Blank made of soft tool steel for nests
F. Female for work not having centers

Send for Literature

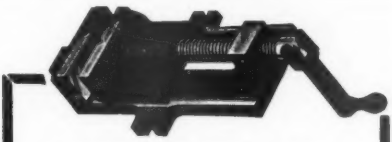
PAT. PEND.

THE TAPERED SEAT ASSURES ACCURACY OF ± .0001

TERRITORIES OPEN

KING PRODUCTS

66 SPRING STREET • NEW YORK 12, N. Y.



YOST DRILL PRESS VISE

This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

Offered in two sizes.

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	3½	12½
2D	5	5½	23

Do you need a vise of ANY type?

Write today for bulletins on the extensive Yost line

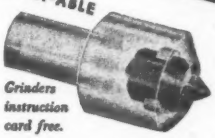
YOST MFG. COMPANY

1000 MAIN ST.

MEADVILLE, PENNSYLVANIA

DIAMONDS for Victory

BIG-HED-NIBS
LOC-KEY-SET
RE-SET-ABLE



Grinders instruction card free.

Cooler dressing
Closer tolerances
Micrometer Accuracy

Because: Wing key heat dissipation and absolute diamond lock nib.

• Three grades of diamonds. Common quality $12 per karat. Medium quality $24 per karat. Select quality $48 per karat. (Contour template diamonds supplied only in Medium and Select quality.)

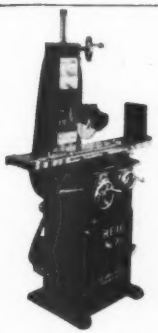
All diamond sizes ⅛ to 10 karat are nib mounted for immediate shipment . . . Billed subject to approval. Specify quality of diamond wanted. We recommend a minimum size of one karat for each 6" diameter of grinding wheel. (24 hour resetting service, $1.00 post paid.)

The Most Complete and Up-to-the-Minute Line of Diamond Tools for War Production.

Distributed thru Mill Supply Jobbers

Send for Free Catalog and Grinders Instruction Card

DIAMOND TOOL COMPANY, Not Inc.
Sheldon M. Booth, Pres.
935 E. 41st Street CHICAGO, ILL.



REID *Automatic Feed Surface Grinder No. 2A*

A Proven Product for Over a Quarter Century with Thousands in Use Daily.

PRICE $790.00 F.O.B. Less Motor

Send for Descriptive Literature

EXCELLENT DELIVERIES

Our dealers will help you fill out necessary priority forms. Write us today for your nearest dealer's name and address.

Exclusive Selling Agents

H. LEACH MACHINERY CO.

387 CHARLES ST. PROVIDENCE, R. I.

Agents in all Principal Cities Throughout the World

Coated Abrasive Belts and Discs

IN STOCK FOR IMMEDIATE DELIVERY

These Popular Sizes Available in All Grains

BELTS		DISCS
1x42"	6x48"	12"
4x36	6x48-5/16	14
4x36¼	6x54½	15
4x52½	8x61	

Many other sizes available for 2-week delivery from receipt of order, including water proof type belts. Complete Stock rolls, sheets, fibre combination discs.

Order Today

WALLS SALES CORP.

97 Warren St., New York, N. Y.

Columbia TOOL STEEL

WE PAY TRIBUTE . . .

—to the men of the Metal Fabricating Industries for extraordinary skill, work and results in the war effort.

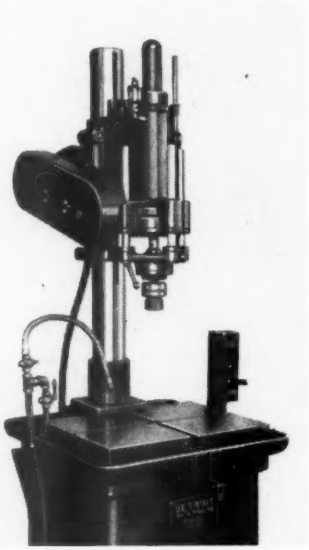
These men are making outstanding performance for which we should all be grateful.

It pays to use Good Tool Steel.

COLUMBIA TOOL STEEL COMPANY

Light Duty Tapping Machine

INCREASED accuracy is one of the main features of the new series of "Detroit" light duty tapping machines, which are rated in capacity up to ⅞"—14 in mild steel.



The tapping head and motor are raised and lowered by a rack and pinion operated through worm gearing to accommodate work of varying heights and may also be swung horizontally through an arc of approximately 90°, making it possible to tap at different stations on the table or fixture. This applies to either single or multiple tapping heads.

The standard table is square and is provided with T-slots. A rotary indexing type work table of 15" diameter is also available. Pedal control is provided for easy locating of the work.

The tapping spindle is controlled by guide rods throughout the entire length of its stroke and the movable head, in turn, guides the driving end of the tapping spindle. Further assurance of accuracy, especially on deep holes, is obtained by driving the tapping spindle at a point between the tap and the lead screw itself thus eliminating the necessity for the lead screw to drive the tap. This feature precludes the possibility of

(TO PAGE 196—PLEASE)

FINISH-REAMS ANY MACHINABLE METAL . . . BUT FAST!

Spiral blades revolve in opposite directions simultaneously on the patented Evans High-Speed Steel Expansion Reamers. Mirror-smooth holes are produced, even over keyways or split bushings. On some applications they outlast ordinary one-piece reamers 100 times.

- Eliminates Honing
- .035" to .080" Straight Line Expansion
- Extensions and Pilots for Line Reaming
- No. 1 to 5 Morse Taper Shanks Available
- Butt Shank Available for Turret Lathe
- Taper Bushing Available for Line Work

EVANS REAMER & MACHINE CO.
526 South Main Street • New Lexington, Ohio
Established 1918

M·B *MODEL SS-SR*

"SUPER-SPEED" Pneumatic
GRINDER

The only hand grinder with spindle speed of 100,000 R.P.M. on 100 pounds air pressure. It has revolutionized hand grinder performance. Can be directed in any working position; operates with extreme ease. Steel construction throughout. Formed to fit the hand. Weighs only 14 ounces. WRITE FOR CIRCULAR.

M·B PRODUCTS
130-134 E. LARNED ST.
DETROIT 26, MICHIGAN

VIMCOLIGHT

EYE HAZARDS REDUCED
Production Increased!

Restful, on-the-spot VIMCOLIGHT promotes workers' accuracy and speed by reducing eye fatigue. This even-glowing, diffused light can easily be adjusted to reach those hard-to-light places. It cancels out the shadow menace. Standard equipment on many leading machine tools. Write for circular. Vimco Manufacturing Company, 117 Chenango Street, Buffalo 13, N. Y.

Die & Tool Makers
DESIGNERS AND MANUFACTURERS OF DIES · TOOLS · GAUGES · JIGS AND SPECIAL MACHINERY

J. J. BARTH, President
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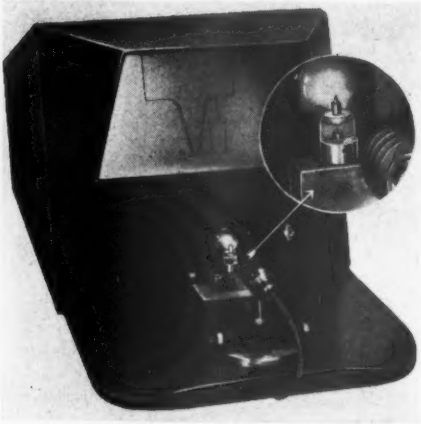
BARTH STAMPING & MACHINE WORKS CLEVELAND, OHIO
JOHN A. BARTH, Chief Engineer
ROBERT A. BARTH, Superintendent

BARTH STAMPING & MACHINE WORKS · THE BARTH MANUFACTURING CO.
DENISON AND WEST 34TH STREET CLEVELAND OHIO 1826 COLUMBUS ROAD



Youngs Profile Projector Gage

The war-acceleration of modern mass production of intricate, small parts and ordnance material has necessitated corresponding progress in gaging technique. The major improvements and innovations in the field of "production gaging" can be attributed to the introduction of optical gaging methods with their characteristics of high speed, accuracy and ease of manipulation.

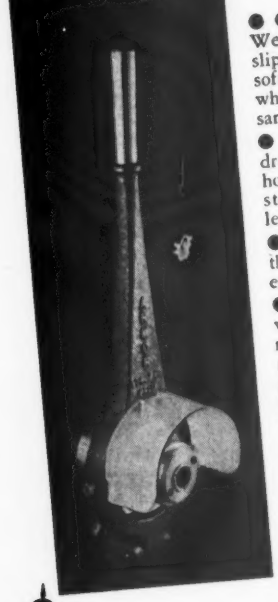
The Youngs Projection Gaging Instrument, for example, may be used for inspection on a large or small scale, measuring and gaging at one and the same time as many dimensions as there are involved in the included profile of a work piece. The optical gaging process is preeminent in such applications.

In one case history, involving the production of the point pin illustrated on the screen, up to 1000 pieces per hour have been handled by one inspector checking several dimensions at one time. The insert shows the inexpensive holding fixture which is simple to load at high speed. The work holding stage is readily adjustable to facilitate properly positioning the work to be inspected in relation to the optical axis.

The projector's standard magnification is adjustable to 20X, 25X and 30X, and the effective screen area has a height of 12" and a width of 15".

Detailed and illustrated information may be had from the Adroit Manufacturing Co., Inc., 92 Warren Street, New York, N. Y. 881-H

Armor COLLET CHUCK



● CAN'T-SLIP. Exclusive Wedge-Lock feature prevents slippage when working either soft or hardest alloy steel, even when material is several thousandths over or under size.

● ACCURATE. Combination draw-back and push-out action holds material securely against stop, insures accurate stock length.

● NO LUBRICATION of the Armor Collet Chuck is necessary.

● RUNS COOL. Revolves with spindle, and so requires no bearings or gears to generate heat or consume power.

● FULL SPINDLE CAPACITY for small lathes having 1½"-8 thread spindles.

● COLLETS IN STOCK. Collets are available to full spindle capacity in round, square or hexagon type. Adapters are obtainable to accommodate other well known collets.

● PROMPT DELIVERY. Write today for Bulletin.

ARMOR

AIRCRAFT MACHINERY CORP.
214 W. Orange Grove, Burbank, Calif.

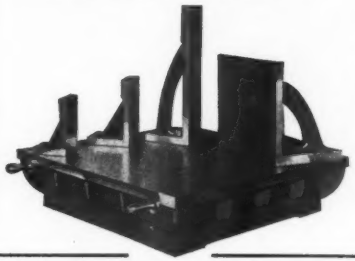
DUPLEX M-6
BAND AND DISC GRINDER

The latest in pedestal type grinders. Actually two machines in one! 14" disc for all rough work . . . 6 x 48" band for finishing. Precision-built to meet wartime production standards — quickly, economically!

Other styles and sizes in New Booklet on Finishing—Write Today

WALLS SALES CORP.
97 Warren Street New York, N. Y.

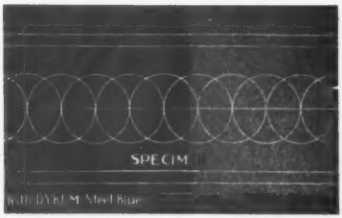
MILWAUKEE
Surface Plates



A full line of surface plates, angles and box parallels. Standard plate sizes from 8"x 8" to 48"x 96", larger sizes with or without legs. Plates are finish-planed and scraped to insure a very accurate surface.

Write for details

J. C. BUSCH CO.
Engineers & Machinists Since 1907
172 SO. FERRY ST., MILWAUKEE, WIS.



DYKEM STEEL BLUE
STOPS LOSSES
making dies & templates

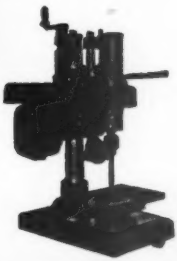
Simply brush on, ready for the layout in a few minutes. The dark blue background makes the layout lines show up in a sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information.

THE DYKEM COMPANY
2201 N. 11th STREET ST. LOUIS, MO.

The HAMILTON MUEHLMATT Super Sensitive DRILLING MACHINE

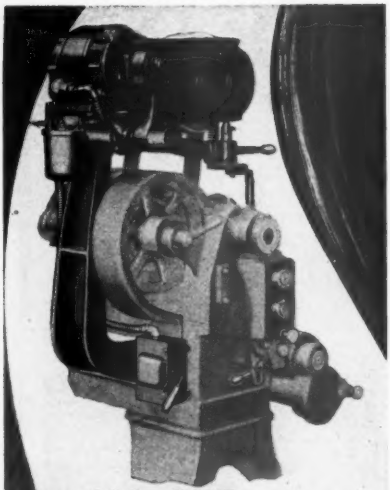
SAVE ON SMALL DRILLS — USE THE HAMILTON



You Can't Afford Slips When Drilling Tiny Holes

That's why the Hamilton does such a swell job . . . amazingly accurate, precision drilling of holes from .004 to 5/16" diameter.

THE HAMILTON TOOL CO.
Ninth and Hanover Streets,
HAMILTON OHIO



GO **ALL-OUT**
ON WAR PRODUCTION
with **CULLMAN** DRIVES

Add 25% to your output from shaft driven machinery by individualizing lathes, screw machines, shapers, punch presses, milling machines and similar equipment with CULLMAN Motor Drives.

You can have instant control, belt-drive smoothness and modernized machine units at a fraction of the cost of new machines.

CULLMAN Drives are available for motors ranging in size from ¼ to 15 H. P. Installation is a simple matter—usually requiring only four bolts. Prompt delivery can be made.

CULLMAN
WHEEL COMPANY
1332 Altgelt St., Chicago 14, Ill.

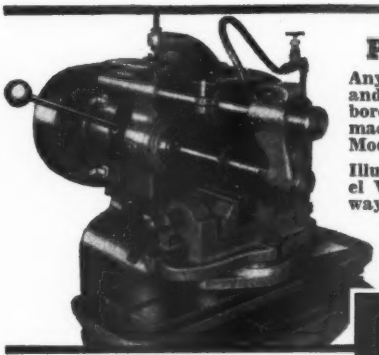
Speed Inspection in YOUR plant with this

EASY-TO-READ
EASY-TO-USE
PRODUCTION GAGE

PRICED FROM **$9.75** UP

Would you like to know more about the new, war-born TRICO MICRO-CHEK now speeding up the gaging of millions of precision parts in over 3300 war plants? How inexperienced girls quickly become dependable inspectors? Send for our booklet which shows many applications of this accurate, speedier comparator gage.

TRICO **MICRO-CHEK**
TRICO PRODUCTS CORP.
12 Trico Square, Buffalo 3, N. Y.



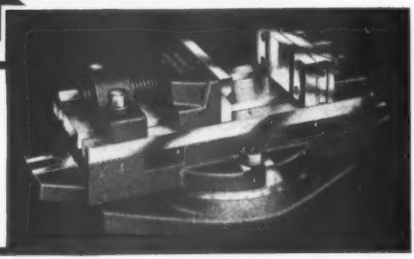
Producto Tool Room Vises

Anything from a small precision, hardened and ground Vise for surface grinders or jig borers to large heavy duty Vises for milling machines comprises the Producto line of Modern Machine Vises.

Illustration below shows 6" Heavy Duty Swivel Vise with hardened and ground jaws and ways on body.

Ask for new bulletins on these tools.

Also manufacturers of Producto Die Sets and Die Makers' Accessories.

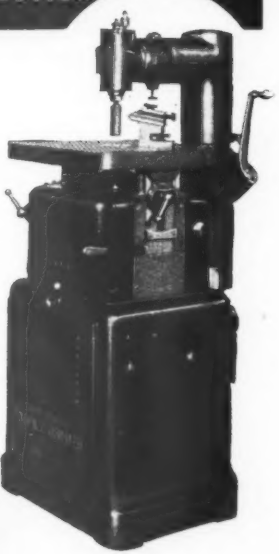


THE
PRODUCTO
MACHINE COMPANY

990 HOUSATONIC AVE., BRIDGEPORT, CONN.
3017 MEDBURY DETROIT, MICH.

BOYAR-SCHULTZ PROFILE GRINDER NO. 2

FOR THE TOOL ROOM . . . FOR PRODUCTION



A highly efficient machine tool for grinding irregular contours, odd shapes and profiles in tool rooms and die shops and also in production. It is efficient because of the high speed at which the grinding spindles turn . . . 10,000 R. P. M. This speed assures rapid removal of stock, even with the small wheels necessary in confined openings and small radii.

Such pieces as flat cams, irregularly curved and hardened templates, forgings with flashes and many other hardened parts can be rapidly and uniformly finished to close dimensions.

WRITE FOR FULL DESCRIPTION

BOYAR-SCHULTZ CORPORATION
2112 Walnut Street CHICAGO 12, ILL.

ASA Standards

The American Standards Association has recently approved two standards in the fields of small tools and machine tool elements: "Tool Shanks and Tool Posts" (B5.2-1943) and "Spindle Noses and Arbors for Milling Machines" (B5.18-1943). The new standard on tool shanks and tool posts is a revision of the American Standard "Tool Holder Shanks and Tool Post Openings" (B5.6-1929) and the standard on spindle noses and arbors for milling machines was originally developed by a committee of the National Machine Tool Builders' Association. Write the Association at 29 W. 39th St., New York 18, N. Y. Prices: Tool Shanks and Tool Posts, 35 cents; Spindle Noses and Arbors for Milling Machines, 25 cents.

(CONTINUED FROM PAGE 156)

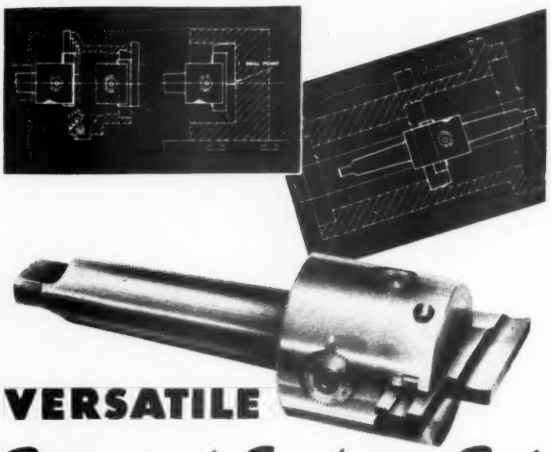
sufficiently long to assure continuous alignment.

When using the dial indicator snap gage, the normal position of the indicator is at the lower end of the gage frame. This permits the weight to be carried on the stationary anvil instead of the gaging anvil, resulting in maximum accuracy. Where it is impossible to use the gage in a normal position because of interference, it can be reversed with the indicator on top without impairing the accuracy of the reading. When used in this manner, a slight upward pressure, to offset the weight of the gage, permits locating from the stationary anvil and relieves the movable anvil of weight.

The adjustable anvil has a maximum range of 1" which enables each gage to be used on a variety of work diameters. The backstop is formed with a radius which permits the gage to be presented to the work axis at angles other than 90° without impairing the accuracy of the reading. The backstop is adjustable to accommodate any work diameter within the range of the gage.

The gage frame is light in weight, but because of its special design is adequately rigid and free from stresses. The handhold has been formed to assure a comfortable grip and reduce fatigue. Serrated, plastic grips on each side of the gage frame insulate the gage against temperature of the operator's hands.

Illustrated literature and specifications may be obtained from The Sheffield Corp., Dept. TJ, Dayton, Ohio. 24-H



VERSATILE

Boring and Spotfacing Tool

IN ADDITION to simplifying precision boring through the use of micrometer settings and making possible the facing of surfaces flat and square with holes, this unique B & B Tool brings you many other advantages.

It can be used for inverted boring and back spotfacing; it will bore and face many diameters at one time with a stepped blade; it presents a definite advantage in boring blind holes; and is a decided asset for use in boring long holes.

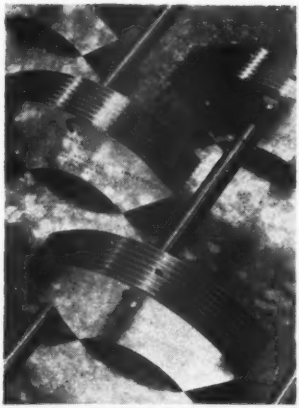
It will enable you to produce more accurate work with fewer motions in much less time. Users consider it one of the most valuable tools in their tool rooms.

The many sizes of standard blades available provide an exceptionally wide range of cutting widths.

BUY WAR BONDS

BOKUM TOOL CO.

14775 WILDEMERE AVE. · DETROIT 21, MICH.



SPECIAL OR STANDARD GAGES OF ALL TYPES

These special segment thread gages are examples of the wide variety of thread, plug, and ring gages being regularly produced in our plant. Designed by our staff of engineers and manufactured to specified tolerances, they represent the highest skill and craftsmanship. The same high standards apply to special tools, fixtures, machines and parts, produced singly or in volume on contract. Our facilities and equipment are equal to the finest in the country. Write for literature describing these special engineering and manufacturing services, and our line of standard gages, carried in stock for prompt shipment.

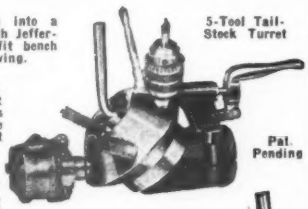
MERZ *Engineering Company*
INDIANAPOLIS 7, INDIANA

CONVERT YOUR ENGINE LATHE INTO A TURRET LATHE IN 15 SECONDS

Photo above shows Jefferson Turrets on 16" Lathe

CONVERT your engine lathe into a Turret Lathe in 15 seconds, with Jefferson Turret Attachments. To fit bench lathes and lathes up to 24" swing.

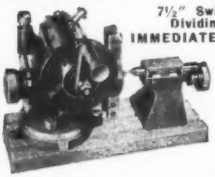
This new modern Tail-stock turret (right) made in 4 sizes to fit small bench lathes and lathes up to 24" swing. Also the adjustable Pull-Feed lever (not illustrated).



5-Tool Tail-Stock Turret

Pat. Pending

Then there's the completely modernized Tool-Post Turret (right, below) made in 2 sizes, designed to increase production on engine lathes. Easily mounted on cross slide or compound rest. Has capacity of 4 standard tool holders which are easily inserted and rigidly held.



7½" Swivel Base Dividing Head
IMMEDIATE DELIVERY

Turret deliveries 6 days

Jefferson Turrets are real production tools, substantial, rigid, accurate. They must not be confused with the small make-shift gadgets now on the market.

Also—Milling Machines, Dividing Heads, Vises, Belt Sanders, Swing Frame Grinder, Gyratory Foundry Riddles.

Some territories still open for dealers and salesmen.

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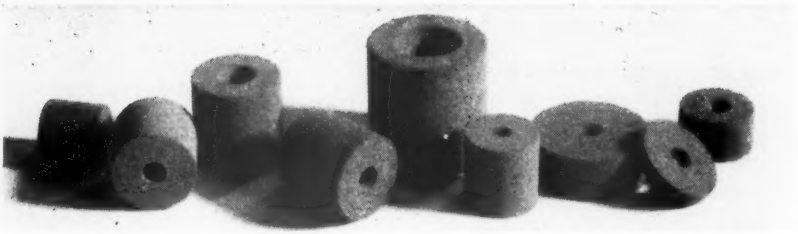
Tool-Post Turrets, Tail-Stock Turrets, Adjustable Pull Feeds, Belt Sanders, Gyratory Foundry Riddles, Overhead Swing Frame Grinders, Milling Machines, Dividing Heads and Vises



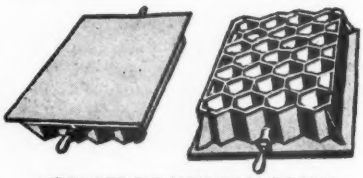
Norton Company of Worcester, Massachusetts, announces that grinding wheels made of their 57 Alundum abrasive are now generally available as production capacity has been increased. 57 Alundum abrasive is an improved aluminum oxide product developed by the Norton research laboratories several years ago and which proved successful in wheels for cylindrical grinding, centerless grinding, internal grinding and snagging (slow speed).

Production facilities at the time of introduction were limited, however, so that it was necessary to confine the use of 57 Alundum grinding wheels to the critical war jobs where the special characteristics were most beneficial.

57 Alundum abrasive is more friable than regular Alundum abrasive. This means that wheels of 57 Alundum have a fast, cool cutting action. They also have the ability to hold shape and have been especially successful where the ability of the wheel corner to stand up is very important.

57 Alundum grinding wheels are available in the patented Norton HE vitrified bond as well as in regular vitrified bond in a wide range of grain sizes, grades and structures.

USE MEEHANITE METAL SURFACE PLATES



LOOK FOR THE HONEYCOMB BASE!

—The **SURE** *way to get* **POSITIVE PRECISION**

Here's one way to get built-in, positive precision in surface plates — make sure to use Meehanite Metal Surface Plates with the special weight-distributing Honeycomb Base. The extra 33 per cent weight advantage which these surface plates have over other quality plates is distributed evenly over the entire surface. They are hand-scraped to extremely close tolerances.

They are available in 22 standard sizes ranging from 3½ x 4 to 48 x 96. They weigh from 5 lbs. to 6000 lbs., are from 2½" to 12" in height, while tolerance ranges from .0001" to .0005". Other sizes to specification. Angle plates and straight edges of Meehanite Metal also available. Good deliveries on most sizes. Write for folder. Prices on request.

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KUTMORE *High Speed*

PROMPT DELIVERY

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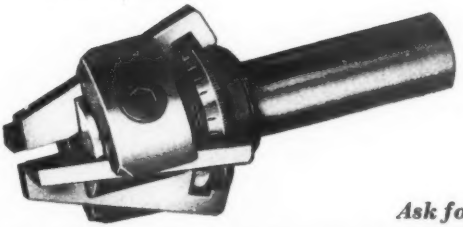

The large range covered enables you to handle tough jobs as well as delicate instrument work.

Our large and complete stock insures immediate shipment.

4 and 6 Blade Mills, 34 Standard Models, Specials Made to Order.

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ON SMALL, FUSSY JOBS

This compact, rugged precision machine has been designed especially to save precious hours in toolroom set-ups and changeovers. It frees your larger machines for heavier work . . . saves time and power.

The LINLEY performs a wide variety of jobs such as DIE WORK, JIG, and MODEL MAKING, METAL PATTERNS, REAMING, MILLING at high speeds. Micrometer setting eliminates pencil figuring errors. Eight spindle speeds . . . one for every need (275 to 4250 r.p.m.). Large capacity for a small machine (18½" x 20" floor space.)

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Frequency Modulation for a Soldier Named Joe

Because of the timeliness of the subject we are quoting the following excerpt from a speech made by Mr. F. R. Lack, vice president and manager of the Radio Division of the Western Electric Company, before a recent meeting of the Frequency Modulation Broadcasters, Inc.:

"What are Western's plans for FM? I am happy to say that we have nothing new to show you now and nothing new to talk about. I am happy because I do not have to tell a soldier named Joe, who needed a radio very badly last month, that we could not deliver it because we diverted some engineers and some shop people to building models of new super-dooper FM equipment to show you and thus strengthen our postwar position. I am sorry that I can't tell you when we will be able to talk. But then no one can tell me when the war will be over . . . Down at our shop, soldier Joe has a perpetual AAA and . . . during the years 1942 and 1943, with the assistance of our subcontractors, we delivered 129 million dollars' worth of FM to soldier Joe. In this connection I should like to . . . tell you a story that has not been told before. When the Army came to us and asked for FM equipment I went to Major Armstrong for a license. He said, 'As you well know, I served in the last war but they won't take me for this one but I should like to do my bit. You can build all the FM you want for the Armed Services and the license fee will be one dollar.' I take off my hat to him. I don't think anyone would have begrudged a reasonable license fee to the Major to help him pay for his continued experimental work . . . When the war is over, all our experience will be available to you, your consulting engineers, and your own engineering staff, and when Uncle Sam says 'Hold, 'nuff' we hope we will have the privilege of going to work on your problems."

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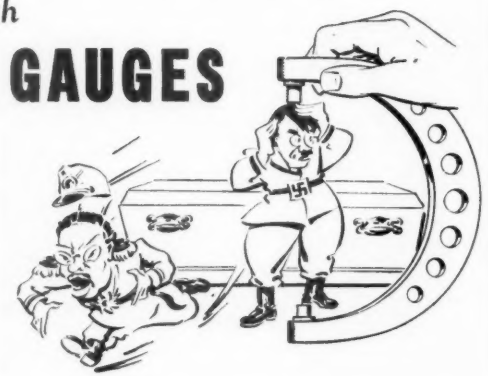

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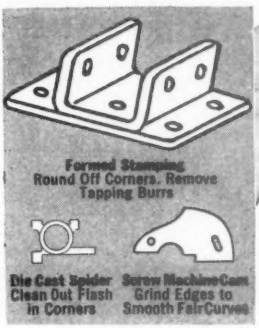
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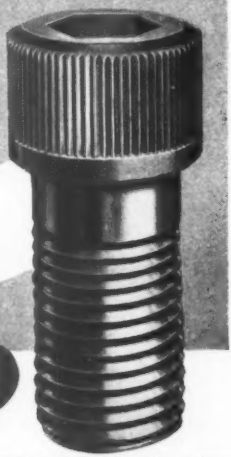

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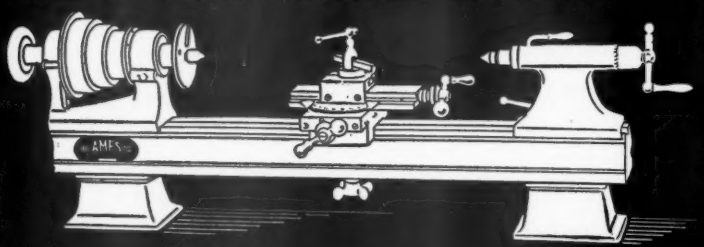

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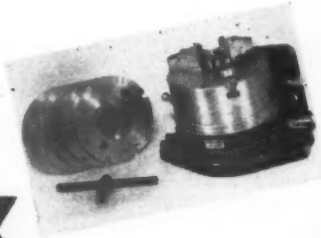

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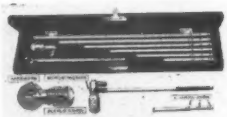

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Also M & L Precision Tapper—Sine Plates and Bars—Universal Angle Plates

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(CONTINUED FROM PAGE 182)

inaccuracies caused by lead screw "wind-up."

The lead screw and bronze lead nut are of the interchangeable type and may be removed as a unit by removing the dust cap and one screw. The lead screw is of high speed steel, hardened and ground. The two-piece bronze lead nut can easily be adjusted to take up wear and remove backlash.

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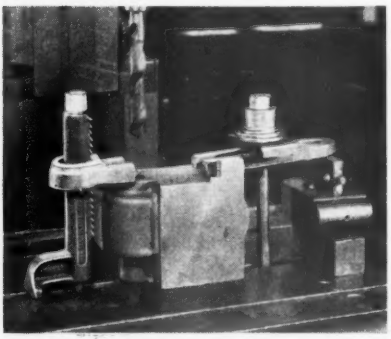

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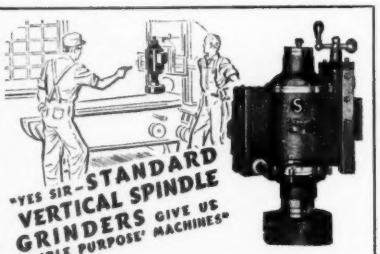

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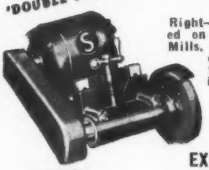

Right—it can be easily mounted on your Planers, Boring Mills, Shapers, Milling Machines, etc. Adaptable for Wet or Dry Grinding.

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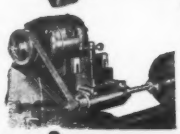

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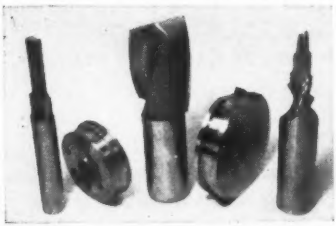

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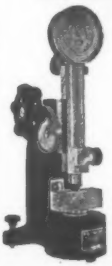

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New Patents of Tooling Interest

(for obtaining, see page 202)

TOOLHOLDER, No. 2,332,417.
METHOD AND APPARATUS FOR RELIEVING CUTTERS, No. 2,332,420.
METHOD AND MACHINE FOR RELIEVING CUTTERS, No. 2,332,421.
UNIVERSAL TOOLHOLDER, No. 2,332,449.
CUTTER GRINDER, No. 2,332,510.
DEPTH GAUGE, No. 2,337,690.
ARTICLE WORKING APPARATUS, No. 2,337,696.
COLLET INDEX FIXTURE, No. 2,337,707.
LATHE CENTER FOR WOOD PATTERNS, No. 2,337,727.
LATHE, No. 2,337,761.
THREAD POLISHING APPARATUS, No. 2,337,776.
FORMING TOOL, No. 2,337,797.
DRILL POINT GAUGE, No. 2,337,819.
MICROMETER, No. 2,338,001.
FLUID PRESSURE OPERATED CHUCK, No. 2,338,060.
METHOD AND MEANS FOR FINISHING THE TOOTH GROOVES OF GEAR SHAVING TOOLS, No. 2,338,061.
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Now available in 4-Arm, 51" high or the new 5-Arm-Rack, 57" high. Used wherever flat or round bar stock or tubing is kept—factories, warehouses, schools, large & small shops. Four times the usual capacity for the floor or height space. Low cost, & money or space saved.
Send for priced circular.
Priority Regulations Govern Delivery
Wm. S. Yohe Supply Co.
507 Gibbs Ave., N. E.
CANTON 4, OHIO

WANTED:
MANUFACTURERS' REPRESENTATIVE

A number of territories open to sell on commission basis outstanding Machine Tool Accessory line also a Flexible Coupling of exceptional merit. Write giving full details as to present connections and past experiences. All correspondence kept confidential.

Box AM-2
TOOL & DIE JOURNAL
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METAL INDENTING MACHINE

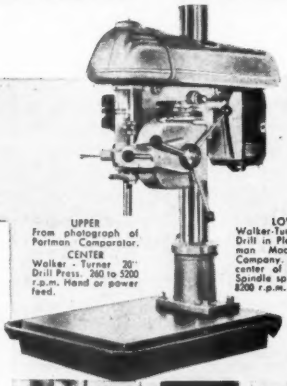
Hand Lever Press illustrated is fitted with an automatic Numbering Head for indenting serial numbers or lot numbers in metal parts.

For Indenting and Embossing Machines, Steel Stamps, Numbering Heads, send for Catalog H.

MARKING EQUIPMENT
ADOLPH GOTTSCHO, INC.
190C DUANE ST. NEW YORK 13 N.Y.

For Precise Work and Fast Production

it's **WALKER-TURNER MACHINE TOOLS!**



UPPER
From photograph of Portman Comparator.

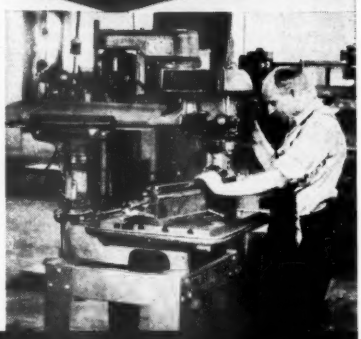
CENTER
Walker - Turner 20" Drill Press. 260 to 5200 r.p.m. Hand or power feed.

LOWER
Walker-Turner Radial Drill in Plant of Portman Machine Tool Company. Drills to center of 62" circle. Spindle speeds 160 to 8200 r.p.m.

WALKER-TURNER MACHINE TOOLS have "what it takes" for precise work as well as for fast production. The rigid requirements of many of the products on which they are used offer positive evidence of this. The Portman Comparator is an excellent example.

Walker-Turner quality is the result of careful design and discriminating selection of materials by engineers who pioneered the principle of weight conservation in machine tools. That is why industry is using more than 100,000 Walker-Turner Machine tools today. Send for latest catalog.

WALKER-TURNER COMPANY, INC.
5694 Berckman Street, Plainfield, N. J.



walker-turner
COMPANY, INC.
PLAINFIELD, N.J.
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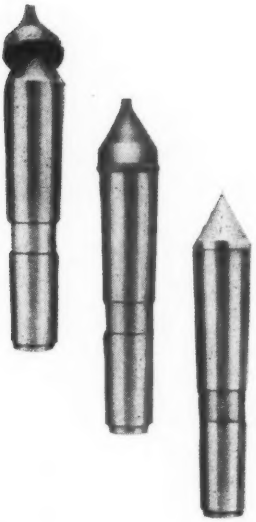
MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

Use COLMONOY

HARD FACING ALLOYS AND OVERLAY METALS

TIPS for Lathe and Grinder Centers Made of COLMONOY No. 6



In addition to supplying COLMONOY Center Tips, we are now in position to provide complete retipping service on centers.

This service consists of casting tips of COLOMONY NO. 6 and applying them to your centers by the use of Silver Solder or a low temperature brazing alloy. By the use of this method your worn or used high speed steel centers can be salvaged, and such reclaimed, COLOMONY tipped centers will outlast and outwear new, untipped centers.

Charges for this work are moderate. For full information, covering prices of tips as well as application by us, write for Bulletin CT-1.

OFFICES

Detroit, New York, Blasdell, N. Y., Chicago, Tulsa, Los Angeles, San Francisco and in Canada.

WRITE FOR LITERATURE

In addition to Bulletin CT-1, mentioned above, we shall be glad to send you our General Catalog No. 75, covering the complete line of Colomony Hard Facing Alloys, and illustrating typical applications.

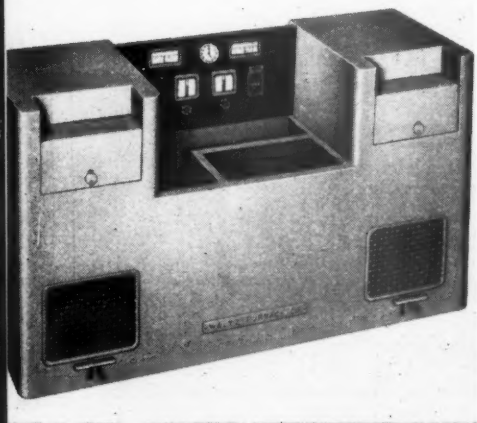
WALL-COLMONOY CORP.

720 Fisher Bldg., Detroit 2, Michigan

New Waltz Combination Heat Treating Equipment

Designed to do a complete heat treating job this new combination unit has a high temperature hardening furnace on the left, quench tanks in the center and a recirculating draw furnace on the right. The temperature in the hardening furnace is automatically controlled to hold any temperature in the range of 1350 degrees to 2300 degrees. Within the muffle, a protective atmosphere can be introduced which is controlled by the two valves located beneath the gages shown. These gages make it possible to duplicate the atmosphere once the type needed has been established. Seven inch thick walls of fire brick and block insulation insure efficiency. The recirculating draw furnace has a controlled range of 250 degrees to 1100 degrees. Inside the furnace the hot air for tempering, which is heated by a unit in the base, is recirculated by a high velocity alloy steel fan also located in the base. The outside shell is of formed steel all welded construction with air grills as shown. The foot treadles in front are for opening the doors of the furnaces.

Built by the Waltz Furnace Company, Dept. J, 2454 Gilbert Ave., Cincinnati 6, Ohio, and known as model CH, this unit is made in three sizes, 8″ wide x 6″ high x 12″ deep, also in 10″ x 8″ x 15″ and 12″ x 10″ x 18″ sizes, and requires but a gas connection and an electric power outlet. 875-H



Recent U. S. Patents

Among recently issued U. S. Patents the following are of Tooling interest. If you are interested in studying any of these Patents, simply advise "Patent Information Service", The Tool & Die Journal, 2460 Fairmount Blvd., Cleveland 6, Ohio, enclosing 20 cents for each Patent desired and we will gladly forward your order to Washington.

ANGLE DRILL, No. 2,333,025.
TWO COLOR INJECTION DIE, No. 2,333,059.
AUTOMATIC CUTOFF MECHANISM FOR ROD AND WIRE, No. 2,333,823.
RELEASING TAP HOLDER, No. 2,333,868.
TOOL FOR REMOVING FEEDERS OR SPRUES FROM INGOTS AND THE LIKE, No. 2,333,925.
INTERNAL GROOVING TOOL, No. 2,333,935.
CONTOUR GRINDING MACHINE, No. 2,333,985.
MOLDING PRESS, No. 2,334,082.
DRILL, No. 2,334,089.
WORKPIECE SUPPORTING CRADLE, No. 2,334,127.
PUNCHING APPARATUS, No. 2,334,138.
MEANS FOR CASTING METALS, No. 2,334,701.
CUTTING TOOL, No. 2,334,755.
HONING MACHINE, No. 2,334,758.
CUSHIONED CUTTER PILOT, No. 2,334,795.
HONING TOOL, No. 2,334,838.
CENTER DRILL, No. 2,334,845.
MACHINE FOR STRAIGHTENING, SIZING, AND POLISHING TUBES AND RODS, No. 2,334,886.
HOT EXTRUSION OF METAL ARTICLES, No. 2,334,927.
CAM GRINDING MACHINE, No. 2,334,938.
ARBOR, No. 2,334,954.
TRACER CONTROL MECHANISM FOR MACHINE TOOLS, No. 2,334,956.
MEANS FOR CASTING METALS, No. 2,335,008.
LAP, No. 2,335,125.
LATHE CHUCK, No. 2,335,149.
ELECTRIC FORMING, No. 2,335,165.
GRINDING WHEEL TRUING APPARATUS, No. 2,335,207.
GEAR CUTTING MACHINE, No. 2,335,215.
MACHINE TOOL TRANSMISSION & CONTROL MECHANISM, No. 2,335,305.
WHEEL DRESSERS FOR GEAR GRINDING MACHINES, No. 2,335,341.
GRINDING MACHINE, No. 2,335,356.
METHOD OF MOLDING PLASTIC MATERIAL, No. 2,335,371.
METAL CASTING, No. 2,335,385.
WORK TURNING DEVICE FOR MACHINE TOOLS, No. 2,335,468.
GEAR TOOTH, No. 2,335,504.
DEPTH MICROMETER SCRIBER, No. 2,335,513.
PUNCH, No. 2,335,552.
TOOL, No. 2,335,570.
APPARATUS FOR EXTRUSION, No. 2,335,590.
COLLAPSIBLE MANDREL, No. 2,335,602.
DRILL GUIDE, No. 2,335,614.
GRINDING MACHINE, No. 2,335,625.
TURRET FOR ENGINE LATHES, No. 2,335,712.
METHOD & MACHINE FOR METALWORKING, No. 2,335,720.
INDEXING CHUCK, No. 2,335,721.
TAP FOR CUTTING INTERNAL SCREW THREADS, No. 2,335,741.
SCREW THREAD LAPPING DEVICE, No. 2,335,745.
GAUGE, No. 2,335,775.
METHOD OF FORMING CURVED CHANNEL MEMBERS, ELBOWS AND U-BENDS, No. 2,335,887.
DRAWING METAL, No. 2,335,933.
GRINDING WHEEL TRUING APPARATUS, No. 2,336,018.

PRECISION PARTS FOR PRECISION WEAPONS

America's fighting planes, accessories and guns are built to the most exacting standards in industrial history. Split second accuracy is a by-word in weapons vital to Victory and life.

The C. M. Smillie Company is producing quality controlled parts for these precision weapons. Machining, tooling, grinding and inspection of these precision parts must conform to close tolerances.

Personal skill is required in every sequence of operations.

In carrying on this important task for Victory — C. M. Smillie Company has combined its 54 years of manufacturing experience with modern plant facilities and skilled and loyal craftsmen who know precision.

After Victory — C. M. Smillie Company will continue to serve industry with the same high standard of precision parts.

C. M. SMILLIE & CO.

1108 WOODWARD HGTS., FERNDALE, MICH.

PRECISION ◆ YESTERDAY ◆ TODAY ◆ TOMORROW

A FEW OF THE MANY PRECISION PARTS BEING PRODUCED BY C. M. SMILLIE & CO. FOR THE ARMED FORCES

FEDERAL *Taperlock* PLASTIC GAGE HANDLES

MADE of light weight plastic material, Federal Gage Handles are lighter than any metal used, even one-third lighter than aluminum. This lightness permits a most sensitive "touch" with less fatigue in long continued use; an advantage appreciated by women inspectors.

They are highly satisfactory with glass gages; being so much lighter than metal handles, they reduce the danger of chipping and breakage.

Insulating properties help prevent transmission of bodily heat to gages which may affect accuracy.

Marking for identification is accomplished with the same marking tools used for metal gages.

Immediate Delivery

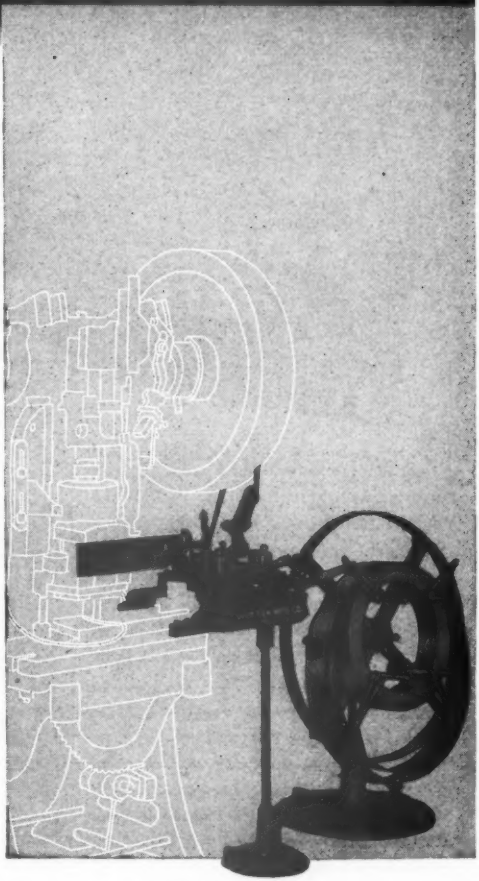
SEVEN SIZES AND COLORS
00, 0, 1, 2, 3, 4, & 5—in Red, Green, Yellow, Black

FEDERAL TOOL CORPORATION
400 NORTH LEAVITT ST., CHICAGO, ILL.

Our Punch Presses Are More Flexible And Productive With WITTEK *Automatic* Roll Feeds And Reel Stands

Manufacturers of metal stampings facing problems in the feeding of coiled strip stock to punch presses will find that Wittek Automatic Roll Feeds and Reel Stands conserve man-hours and achieve new high production levels.

Providing an improved and simplified method of punch press operation, Wittek Automatic Roll Feeds and Reel Stands insure rapid, safe and accurate feeding under all conditions. Made in four different types to meet all automatic feeding requirements. Write for complete details. Wittek Manufacturing Co., 4305-15 West 24th Place, Chicago, Ill.



ARMY-E-NAVY

WITTEK WMCO *Automatic* ROLL FEEDS and REEL STANDS

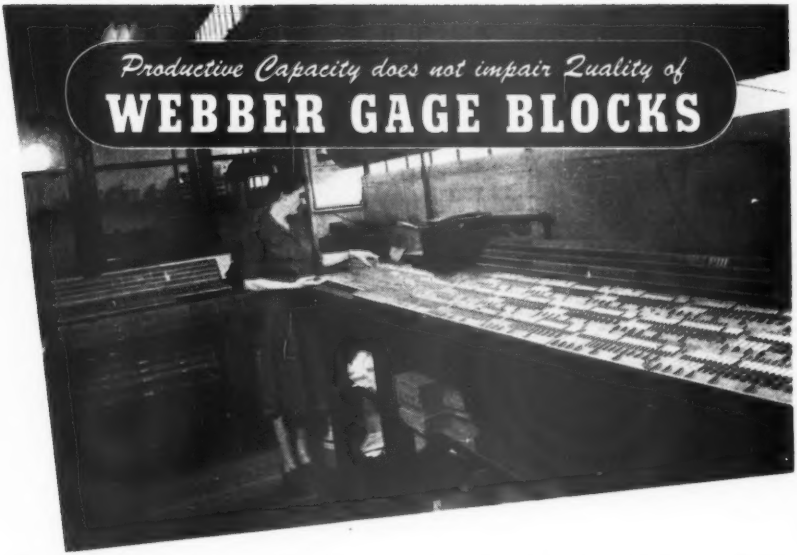
For All Makes and Sizes of Punch Presses

Quick Delivery OF QUALITY CUTTING TOOLS

"if it's an Arnold it's accurate"

Many of America's leading manufacturers have learned that most of the quality cutting tools listed in the new Arnold catalog can reach them surprisingly fast. For instance, three types on which you can expect almost immediate delivery are illustrated above. They are: counterbores, straight and taper shank with interchangeable pilots and Woodruff key seat cutters. Arnold's thirty years of toolmaking experience can provide you with cutting tools that can be depended upon for maximum efficiency, service and accuracy. If you do not have our new 40 page catalog containing the complete Arnold line, send for it at once. No obligation.

ARNOLD
Tool Company
14469 EUCLID AVE.
EAST CLEVELAND 12, OHIO



● This photo will give you some idea of the volume of Gage Blocks running through the Webber plant day after day. Here you see precision gage blocks produced in quantity in the plant of the largest exclusive manufacturer of gage blocks.

Webber Gage Blocks are made under the most favorable conditions in an air conditioned plant — on the most modern equipment available — and tested in a temperature controlled room on instruments that reveal microscopic inaccuracies.

Because of this care of manufacture—under ideal conditions—by skilled craftsmen—Webber Gage Blocks have gained national recognition for accurate measurements in millionths of an inch.

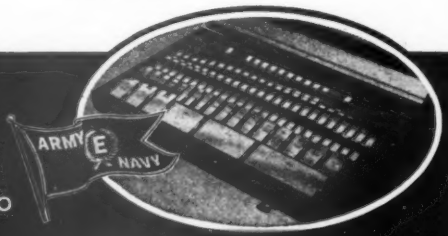
They are now being used in hundreds of plants—in their laboratories—tool rooms—in various vital points of manufacture—to maintain dependable, close tolerances in the finished products of these plants.

Webber Gage Blocks are furnished in "A" accuracy sets tested to .000004 inch and "B" accuracy sets tested to .000008 inch.

Prices as follows:

Set No. 84A—$350.00
Set No. 84B—$235.00
Set No. 43A—$185.00
Set No. 43B—$150.00
Set No. 38A—(Thin Blocks) $195.00
Set No. 38B—(Thin Blocks) $155.00

Webber service includes complete facilities for inspecting, reconditioning, and replacing worn or damaged blocks at a moderate cost.



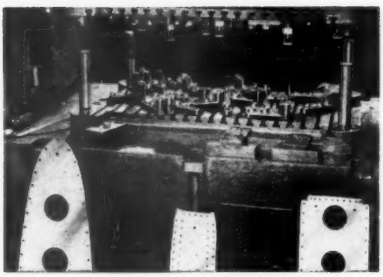
Webber
GAGE COMPANY
12903 TRISKETT RD., CLEVELAND 11, OHIO

ADJUSTABLE DIES
SPEED WAR PRODUCTION

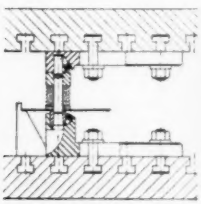
INCREASE HOURLY PRODUCTION—REDUCE "DOWN" TIME

Whistler adjustable die set-up for 12 foot power brake. These same punch and die units can be quickly rearranged for other patterns.

Whistler Adjustable dies are saving the day in war plant "speed-up" schedules by...saving weeks of time normally required in single purpose die making...units can be used over and over in different patterns...new set ups on or off the press in minutes ...all parts interchangeable...work on any type press...perfect precision on long or short runs...no special tools and new workers quickly learn to make press changes.



Another grouping of Whistler Adjustable Dies illustrating re-use of same units. Note close grouping of perforations.



Side view showing construction detail of U-50 Whistler Adjustable Punch and Die unit and typical example of perforated and notched piece produced by Whistler Dies.

Over 25 Years of Tool and Die Making Experience

S. B. WHISTLER & SONS, Inc.

752-756 MILITARY ROAD BUFFALO, N. Y.

Every Production Executive needs this fully illustrated catalog. Sent upon request.

Immediate Shipment
STEEL BOXES
FOR YOUR PRODUCTION NEEDS

STYLE 300 STACKING BOX

Just right for your small parts. Light in weight, easy to handle. Equipped with drop handle each end. Runners save wear on bottom of box and act as positive stacking lock.

No. 301	6″ x 9 ″ x 3½″	20 ga.	$ .55 Ea.
No. 302	8″ x 12 ″ x 4 ″	20 ga.	$ .60 Ea.
No. 303	9″ x 13½″ x 4½″	19 ga.	$ .75 Ea.

STYLE 700 STACKING BOX

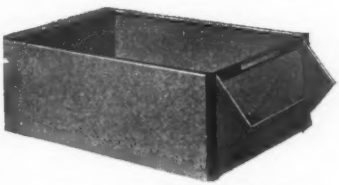
A light weight box designed for quick identification of contents. Will stack with No. 303. Finished olive green enamel, baked on.

No. 703-OG	9″ x 13½″ x 4½″	19 ga.	$ .95 Ea.

STYLE 600 STACKING BOX

An ideal all-purpose shop box. Sturdy all-welded construction. Heavy skids act as positive stacking lock and re-inforce box at point of maximum wear.

No. 601	10″ x 16″ x 6″	18 ga.	$ .95 Ea.



STYLE 500 STACKING BOX

Open front makes contents easily accessible when boxes are stacked. Will stack with Style 600 boxes.

No. 501	10″ x 16″ x 6″	18 ga.	$1.15 Ea.

Prices F.O.B. Factory, Philadelphia. Any Quantity

AMERICAN METAL WORKS, INC.

1531 Germantown Avenue — Philadelphia 22, Pa.

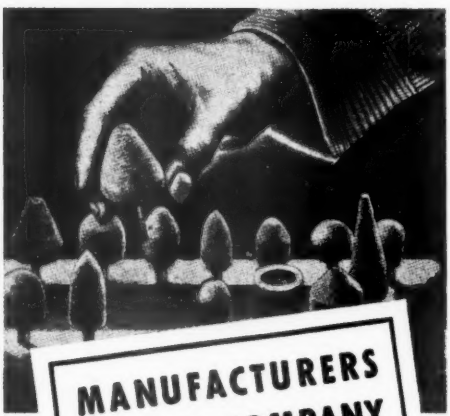
TOUGH But Not BRITTLE!

Safety SUPER-DUTY Set Screw

An unusually strong set screw with all threads die cut — class 3 fit. The sockets are accurately broached, clean and free from grit. The screw is made from special alloy steel, which has been heat treated for maximum toughness, with a tensile strength of 225,000 lbs. to the square inch. The Safety Super-Duty is furnished in any style point shown below.

NATIONAL GRINDING WHEELS

Pay for themselves with longer life, higher grinding speeds and fewer breakdowns. They are investments which pay big returns on production work. Mounted wheels for use in Pattern Shops—Die Shops—Foundries—Auto Body Plants—Plant Tool Rooms—Garages—Rubber Plants—Glass Mfrs.—Textile Mills—Potteries and Home Workshops.



MANUFACTURERS SUPPLY COMPANY
2640 CARNEGIE AVENUE
CLEVELAND, OHIO

When the chips are heavy

STATE REAMERS

COME THROUGH WITH INCREASED PRODUCTION

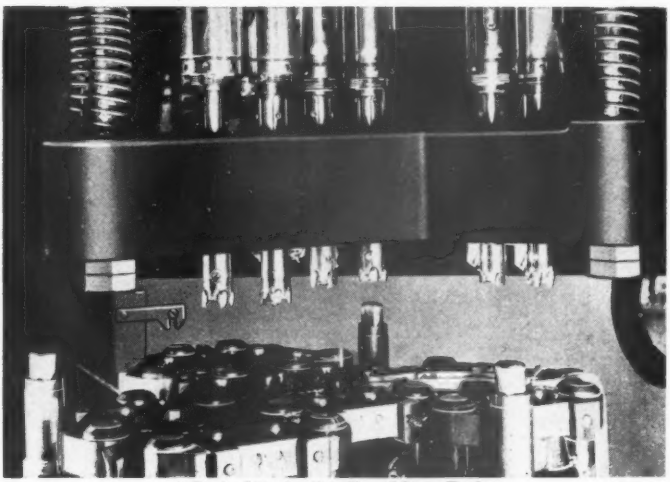
STATE Tools are noted not only for their unusual chip clearance but for many other features including:

1. Quick, accurate, single-screw adjustment.
2. Unusual Bit Expansion insuring many regrinds.
3. Easy regrinding.
4. Solid, sturdy holders of heat treated alloys.

Standard tools are made in 19 sizes to handle ⅞" to 5½".

If our standard models do not meet your needs special tools embodying STATE'S exclusive features *will* solve your problems. Proposals promptly submitted.

A modern high-production plant insures prompt delivery and reasonable prices.



A Typical Production Use of State Tools

★

STATE MANUFACTURING & CONSTRUCTION CO.

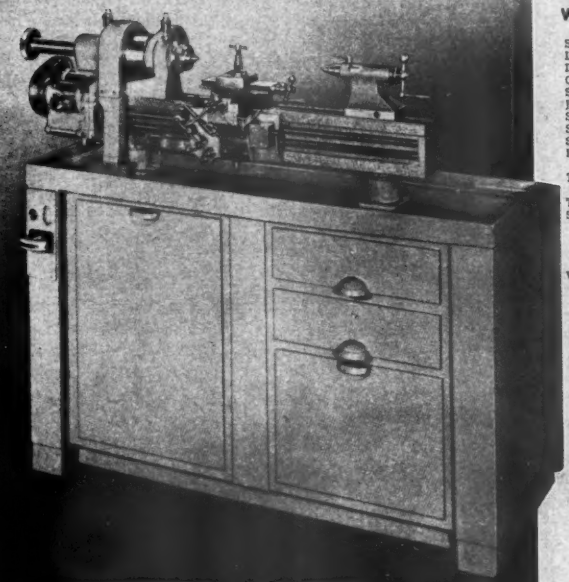
FRANKLIN, OHIO

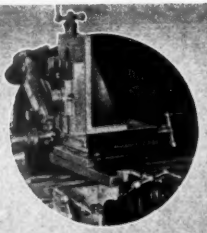
FOR FINE PRODUCTION, REPAIR AND EXPERIMENTAL WORK WITHIN GUARANTEED PRECISION LIMITS

The Rivett No. 608 is a super-precision, back-geared screw-cutting lathe to be designed for fine manufacturing, repair and experimental work. In tool-room and instrument shops it will handle a great variety of precision work to the closest precision limits.

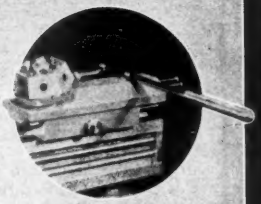
Finely made attachments for [illegible] slotting, relieving, taper turning, ball [illegible] and multiple operations enable the user of a fully equipped No. 608 to finish his work completely without recourse to other machines, and throughout his entire series of operations to utilize the inherent precision of the lathe itself.

ARMY (E) NAVY





Milling



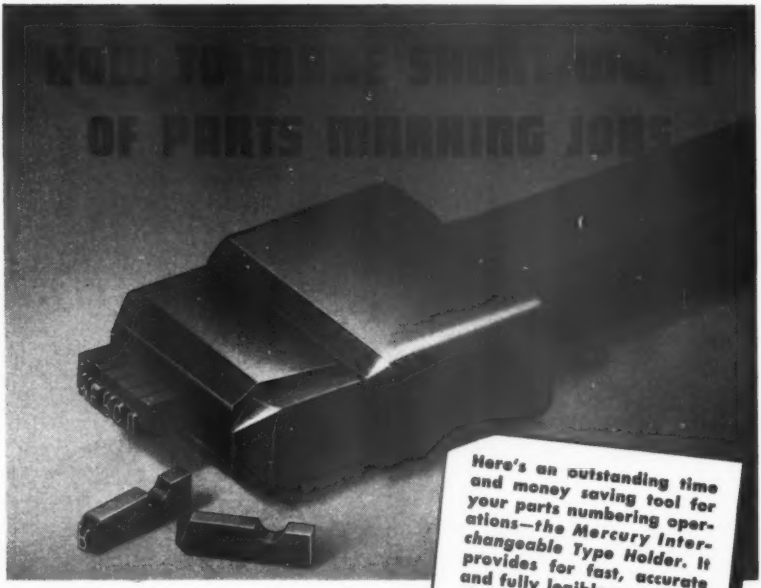
Multiple Operations

SPECIFICATIONS
With Flat or Vee Belt Drive

Swing over bed, dia.	9½"
Length of bed	40"
Distance between centers	18¼"
Collet capacity, max. dia.	1"
Step chuck capacity, max. dia.	6"
Jaw chuck capacity, max. dia.	6"
Spindle capacity, max. dia.	1⅛"
Slide rest, travel of top slide	5¼"
Slide rest, travel of cross slide	4½"
Feed range, through gear box	.0015" to .0220"
Thread range, through gear box	10 to 144
Tailstock spindle travel	3¼"
Spindle speeds:	
Flat belt drive—12 speeds	39 to 1285 r.p.m.
Vee belt drive—12 speeds	25 to 1500 r.p.m.
Weight of lathe, mounting and drive:	
Flat belt drive, net	900 lbs.
Vee belt drive, net	1050 lbs.

For Further Description
Write for Bulletin 608

RIVETT LATHE & GRINDER INC.
BRIGHTON, BOSTON, MASS.



Here's an outstanding time and money saving tool for your parts numbering operations—*the Mercury Interchangeable Type Holder.* It provides for fast, accurate and fully legible numbering of metal parts, eliminating errors, rejects and the time normally consumed in using single-character dies.

HERE'S ALL YOU DO:

Unlike ordinary one-character dies, which must be used separately, the Mercury holds the entire part number—up to 16 digits, if needed. You simply "load" the tool with the correct part number and snap the cover shut. *Thereafter, as many duplicate parts as desired can be quickly and neatly stamped with just a single blow of the hammer for each part!* Time normally lost using a separate die for each separate digit is *saved,* and overlapping, wrong sequence and illegible numbering are eliminated.

The Mercury Type Holder has many more outstanding features you should know about. Type is quickly interchangeable for different part numbers . . . compactness aids in stamping smaller parts . . . all-steel machined construction insures long life, cuts replacement needs. Hardened and ground hand-cut steel type is available in a full range of sizes. Full details, including ordering data and specifications for both hand and press style holders, are contained in descriptive bulletin mailed free on request. Write for your copy today—ask for Mercury Bulletin 1-D

Immediate Delivery

MERCURY METAL DIE AND LETTER CO.

546 EAST 16TH STREET, LOS ANGELES 15, CALIFORNIA

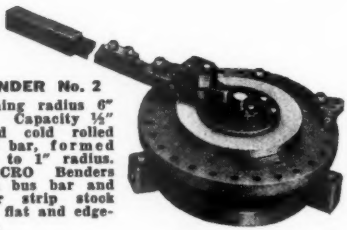
PRECISION CENTERED EYE BENDING with DI-ACRO BENDERS

A Centered EYE in 1 Operation

The DI-ACRO Bender makes perfectly centered eyes from rod or strip stock at the rate of up to 1000 an hour. Both eye and centering bend are formed with one operation. Any size eye may be formed within capacity of bender and ductile limits of material.

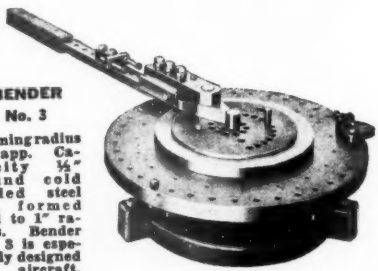
BENDER No. 1

Forming radius 2" app. Capacity 7/32" round cold rolled steel bar or equivalent. All DI-ACRO Benders have two-way action, right or left hand mounting and reversible forming nose.



BENDER No. 2

Forming radius 6" app. Capacity ½" round cold rolled steel bar, formed cold to 1" radius. DI-ACRO Benders form bus bar and other strip stock both flat and edgewise.



BENDER No. 3

Forming radius 9" app. Capacity ½" round cold rolled steel bar, formed cold to 1" radius. Bender No. 3 is especially designed for aircraft, marine and other large radius bending.

DI-ACRO precision bending is accurate to .001" for duplicated parts. DI-ACRO Benders bend angle, channel, rod, tubing, wire, moulding, strip stock, etc. Machines are easily adjustable for simple, compound and reverse bends of varying radii.

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On a GORTON 16-A

50,000

Small Parts like this

How This Job Was Done

TOOLING: 4 standard single-point cutters. 4 flat cams.

SEQUENCE OF OPERATIONS:

1—Turn 30° taper 1/64" long and turn 2° to 3° taper 1/32" long to diameter of .0495" (±.0005").

2—Advance headstock .205" and plunge cut for 3/64" diameter of .0495" (±.0005").

3—Turn taper 2° to 3° 1/32" long and turn 30° taper 1/64" long.

4—Cut off finished part.

MATERIAL: 5/64" dia. S.A.E. No. 1060 steel.

PRODUCTION: 10 pieces per minute.

GREATER ACCURACY . . . IMPROVED FINISH

Reduced Grinding Down-Time
Faster, Low Cost Setups

This manufacturer selected the Gorton 16-A Precision Automatic Screw Machine to obtain greater accuracy and improved finish in machining these cam follower pinions—each completed in *one* operation in 6 seconds!

Simple, single-point tools—easy to grind—brought savings in down time required for grinding the forming tool used in previous methods. Rigid construction of the Gorton 16-A—the heaviest Swiss-Type Screw Machine built—enabled precision performance 21 hours daily on production runs of 50,000 parts. Gorton accuracy and Gorton finish eliminated subsequent operations.

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The Gorton 16-A produces an almost endless variety of short or long, slender parts — diameters .005" to 7/16", lengths 1/32" to 2¾"—complete in one operation.

It does step turning, generates curves, tapers, back recesses, knurls, chamfers, etc. It centers, drills, slots, threads or taps.

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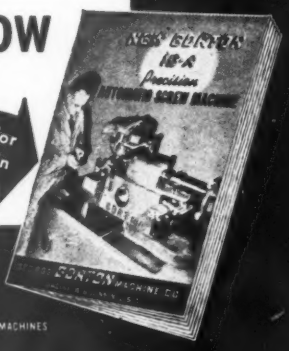

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Gives Better Surface Finishes
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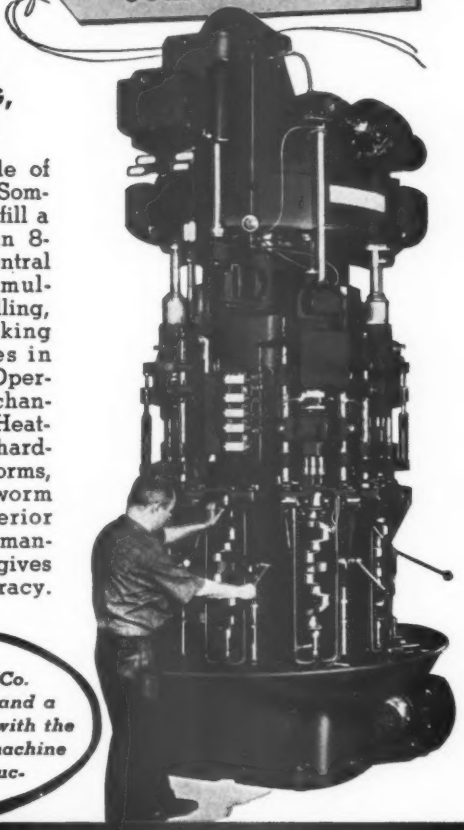

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